

Canadian Ocean Modelling workshop, 11 and 13 May 2026
Wed, May 13, 2026

0:38 – Inge Deschepper

Right, I guess I'll give it another minute to see how many people come and then we can start, I think. Okie dokes. Right, I think we can start and then as people join, they'll join. So, today is day three of the Canadian Ocean Modelling Workshop, so the day will also be separated into two discussion sessions, beginning with the biogeochemical modeling and development and directions that will be led by myself, as well as Elise Olson. And then we will have the cross institute collaborations headed by Natasha Ridenour and Heather Anders. This is the second part we will have about a 15 minute break in between a health break otherwise it can be quite intense, we are recording it so that we can have because we've had a lot of requests for the recordings as well as it is a lot easier to get the transcripts with uh doing the recordings as well so just be aware of that, and then also once again house rules please be respectful of everybody and then also if you can raise your hand it is the little button at the bottom you have react and then you've got within that a little hand emoji that you can press on and that will raise, and then if you are willing to and you have bandwidth it would be great for you to keep your videos on it does allow a bit of community feeling while we're discussing. Otherwise, it's just little gray boxes with names. Great. Then I guess, Elise, would you like to introduce yourself before we hop into the slides?

4:12 – Conference Room (Elise Olson) – Speaker 1

Oh, sure. I'm Elise Olson. I'm in seasonal to decadal prediction here at the, well, new subseasonal-to-decadal prediction group within the climate modeling division here at ECCO. And I'll be one of the facilitators of this discussion with Inge.

4:41 – Inge Deschepper

Great, awesome. Okay, then how the first session will go, we'll do first a little bit of a like one slide recaps from everybody that has submitted slides and then we'll invite anybody who hasn't submitted slides but have some updates that they want us to mention about biogeochemical modeling that they're doing or development to speak and then we'll go through a couple of points and then we can get the discussion started from there. Also it would be great because this discussion is almost like a follow-on from the discussion that we had last year during the workshop as well. So it's building off of that. We don't want to repeat what was said, but try and build from it. And in the meeting notes, there is a table, and it would be great if you could fill in any updates that your group has done, or if your model isn't represented in that table, just to add a row with your information on it because then we've got a little bit of information of who we need to contact if we have questions about different models

and so forth, which would be great to do. Okay. So let me quickly share my screen. Natasha, do you mind giving me share access?

6:16 – Natasha Ridenour

Okay. Okay, um, do I just find you on?

6:25 – Paul Myers

Inge request it and Natasha will then get an automatic button popping up to click yes.

6:30 – Inge Deschepper

That's the problem. There's no, there's no request share.

6:35 – Paul Myers

No, you don't request it. You just try to share.

6:37 – Paul Myers

I did.

6:39 – Paul Myers

Okay. I'm going to take host back off you Natasha. Try to share again, please Inge. Okay.

6:53 – Inge Deschepper

There we go.

6:55 – Paul Myers

Okay. You've got permission. I will give you host back, Natasha.

6:59 – Natasha Ridenour

Sorry. Thank you, Paul.

7:04 – Inge Deschepper

Great. I just want to also get participants and then chat. Feel free to put questions in the chat as well. Um, or comments, uh, if, if you're having issues with your mic, um, I know yesterday there were a couple of early careers that had issues with their mics, but we're easily able to communicate over the chat. So please feel free. So let's hop in. One slide updates. Uh, they are random. They're not in any specific order. Um, so I think the first is Antoine Haddon. Um. Are you online?

7:43 – Antoine Haddon

There we go. Hey, everyone. Yeah, so I'm Antoine Haddon. I'm at the University of Victoria with Nadja Steiner and then also very much assisted by Tessa Sou and a number of other people. I guess we've benefited a lot from the help from everyone at CCMA. And so we specifically work on sea ice biogeochemistry. And over the last couple of years, I've been updating the what we're calling the Canadian sea ice biogeochemistry model. And it's revolved essentially around sort

of collaborating with field scientists, actually, which has been quite nice. So CJ Mundy at University of Manitoba, and then Eva Loy, who's in Norway. And major improvement that we've done to the model is sort of adding ice algal stoichiometry. So a variable carbon-chlorophyll and carbon-nitrogen ratios, essentially. And that allows us to represent some specificities of ice algae, so their ability to photo-acclimate from the very low light in the winter to the to the high light during snow melt. And then some other issues with sort of nutrient uptake, which is a bit different from from phytoplankton. And then I've also been working on how the biomass is exported from sea ice to the ocean. And so all this was done in a 1D framework, really comparing with observations. So we have that in GOTM and FABM. And then I've also been implementing it into NEMO 4.2 and SI3, the version developed and used by the Canadian Earth System Model. The objective there is to have some of these large scale simulations. So I've got there are a couple of plots already of it and I've got it running on the global domain. And we're working a bit getting it on up and running on CanTODS as well to get some higher resolution simulations. Yeah, I think that's it for me.

9:53 – Inge Deschepper

Great. Any questions for Antoine? Okay, we could potentially have after we've gone through everybody's slides, we can have questions at the end. Okay, great. I think, okay, I'm next. So I am currently, I've done biogeochemical modeling in my PhD and also continuing now in my postdoc and I'm with Paul Myers here at the University of Alberta. And we have the luck of having two biogeochemical models that we can use and assess and see which ones can be beneficial for the task that we would like to ask and ask the questions that we want. So the first is a very simplified, low-cost biogeochemical model called BLING, the Biogeochemical Light, Iron, Nutrients and Gases model, which only has sympagic components and it's phosphate-based. And then we also have BiGCIIM, which is the Biogeochemical Ice Incorporated model, And it includes both sympagic as well as pelagic biogeochemistry, a little bit more complicated with two nutrient bases as well as two phytoplankton groups that are resolved. And then like a diagenesis processes in the benthic happening, but not an intensive benthic compartment within the model itself. And currently being busy with upgrading it onto NEMO5 and SI3 system, as well as looking into investigating, we have had issues where we've had numerical instabilities occurring in areas of our large regional ANHA4 domain in areas that experience high tidal mixing and are very shallow. So like Fox Basin area, as well as the English Channel, Chukchi Sea, And it's linked to the Clausius-Clapeyron relationships and situations. So look, investigating how we can fix that, but still have tides within these large domain models. And then also there's a lot of interest in river input through collaborations with the University of Manitoba. So that is from my side. And then I think the next is Yajuan Sun.

12:41 – Yajuan Sun

Oh, hello.

12:42 – Yujuan Sun
Can you hear me?

12:43 – Inge Deschepper
Yes, we can.

12:44 – Yujuan Sun
Okay, I'm here. Yeah, my name is Yujuan Sun. I'm a research scientist at DFO. So this work, I'm just with my colleagues, Diane Lavoie, Joel Chasse, Guoqi Han. So we developed a North Atlantic downscaling ocean, the BGC coupled model system. So for the objective to assess the impact of seasonal and inter-annual variability on the ecosystem in Northwest Atlantic. So that's our model domain. If you could see the red box here, it's not very clear somehow. Yes. So with the large domain is 1/4 degree resolution. And we also have a downscaled model domain. If you see the blue color here, it is a 1/12 degree model. So the ocean model, we use NEMO 3.6 and the BGC model is using CanOE model. So we conducted like a two set of simulation. So one is the hindcast simulation based on the MOI-BIO4 analysis data set. And the other is the climate projection simulation. So, we adopt the global model MPI-HR, well, the high-resolution climate model. So, I – here we present some model validation compare – comparing to a cruise sectional measurement. If you see, that's the – if you see the triangle here, that's where the sectional plotting start from, and also be including, oh, I couldn't see. Well, generally, if you see the first, I think is the, including the alkalinity, the oxygen. And that's the last panel is the alkalinity, I believe so. And then, so that's showing actually very good agreement in the sectional distribution structure. Well, the one application of this model we were trying to see the phytoplankton blooms, we compared our model result with the MOI-BIO4 analysis data set, plus the PML, well, the ocean color data we obtained from PML, so we named it PML, ocean color data. So that's showing the surface variation of chlorophyll concentration. That's showing, actually, if you see the pattern, it's very good pattern for our model result, capture the two peaks of this two blooms around the northwest Atlantic Ocean. And for the – for each comparison is corresponding to the coastal polygons we selected because we divided our whole domain into several sub-regions. For the open ocean, we basically, based on the Longhurst, the biological province, and also plus three coastal polygons over the Gulf of St. Lawrence, Newfoundland Shelf, and Scotian Shelf. We have an issue with this simulation in the model is we producing lower chlorophyll compared to the observational data. Well, but for our model, we don't have any data assimilation, but it shows very, you know, compared to the MOI-BIO4 analysis data, they have the observational well, data assimilation. So actually, we found very interesting. Even they have this variation, the data assimilation, but still showing agreement in the time, those seasonal cycle. So that's very interesting, actually.

So the scorecard shows the spring bloom peaking time. We, if generally just showing very, some, well, consistent structure, like a spatial structure of this, the distribution, even there's some mismatch also. So yeah, we, I think this, this what I want to present.

Inge Deschepper
Thank you, Yujuan.

Yujuan Sun
Thank you.

18:36 – Inge Deschepper
OK, next is Jared Penney.

18:43 – Jared Penney
Yeah, we're good.

18:47 – Jared Penney
Hey, yeah, I'm Jared Penney. I'm a research scientist with Fisheries and Oceans in St. John's, Newfoundland, and this is a project we started a few years ago. Nancy Soontiens initiated this shortly after I arrived here, and we were very lucky to hire Changheng Chen as a physical scientist for a couple years to help us work on this. He just finished up a contract with DFO, so if anybody is looking for a really good modeler or data analyst, he's available. So for context, NL is a fishing-heavy region, so knowledge on spring bloom timing is important for understanding the health of fish stocks. Broadly speaking, it's beneficial when zooplankton for zooplankton, when the timing of the bloom corresponds to the timing of larval production, that's the match mismatch hypothesis. Then when you have more zooplankton available as food, that's beneficial for the health of higher trophic level species. So in the past, in Newfoundland specifically, there was a relationship between the timing of the spring bloom and the timing of the sea ice retreat. And that was generally explained by the onset of stratification due to sea ice melt. But because of climate change, and the changes to the ice season, so like years with less ice or just entire shifts in the season, this relationship doesn't hold in the same way that it used to. So it's reduced the utility of sea ice retreat as an indicator for bloom timing. So this is the context in which we initiated this project. As that traditional relationship breaks down, can we develop a better understanding of the physical processes that affect the spring bloom? And can this be used to develop a forecast model of bloom timing that we can use in fish stock assessments early in the spring? So the focus of this project is a 1D coupled physical biogeochemical model of the water column at long-term monitoring station 27, which is about 10 kilometers from St. John's and 4 kilometers from Cape Sphere. And we had decades upon decades of data for that station. The model itself was built off a one-dimensional model for the bloom that Susan Allen's group developed at UBC, but that was focused on the Strait of Georgia. So we modified it

to remove estuarine effects and account for physics of the coastal ocean. And if you want a couple of references pertaining to that model, they're down on the bottom left corner. We forced the model with weather conditions from the St. John's International Airport and nudged towards Flores salinity means. So there's your NEMO connection. And from this example run here, which is forced using climatological conditions from 1991 to 2020, we can see the, I'm not sure if I have a cursor, but you can see the typical features leading to bloom development at station 27 which is a reduction of winds, re-stratification due to surface freshening, and re-stratification and increased phytoplankton production due to increased surface temperatures. The key physical principle is lower winds and increase in shallow re-stratification decrease the mixing layer depth, they are in magenta on the bottom row, which confines phytoplankton above the compensation depth, and when that persists long enough, you get rapid growth leading to a spring bloom. And now just to examine how well the model is doing predicting the timing of the bloom, that figure on the bottom right there compares the initiation of the bloom from the model that's on the vertical axis to the timing of the bloom in a box around station 27 derived from satellite ocean color. In the left panel, you can see that the model is consistently late compared to observation. However, if we plot the anomalies of bloom timing, between the two different methods, the interannual variability is captured quite well by the model. Unfortunately, there's no real pattern to what years are doing well compared to others. It's not that cold year- colder years do better, warmer years do better. It's a bit all over the place.

22:49 – Jared Penney
And that's it.

22:50 – Jared Penney
Thanks very much.

22:52 – Inge Deschepper
Thank you. OK. And then the next person, I think, is Amber Holdsworth.

23:01 – Amber Holdsworth
Hey, yeah, I'm Amber.

23:03 – Amber Holdsworth
I work for Fisheries and Oceans Canada in Victoria, BC. And yeah, so I do biogeochemical modeling and I don't have anything super exciting that's recent, but I thought I'd share my paper from last year. It's a generalizable method for characterizing ocean extremes using unsupervised clustering. And so basically we assumed that regions that have similar conditions for oxygen, temperature, and acidification are likely to have similar drivers when it comes to extremes. And then, so we use that kind of clustering to try to break down the different influences in the region. And we found that climate indices are predictive of extreme conditions for the Northeastern Pacific

continental margin, being things like PDO and ENSO. And we found that compound extremes are rare, but they're increasing in some regions, with most involving compound extremes of oxygen acidity. And so this was looking at our NEP36 model with CanOE that has been using NEMO 3.6 MC. And it was run from 1996 up to the present. And so I show a little example there of some of the kinds of plots that are in the paper. And then more recently, I added some oxygen diagnostics to the version of CanOE that I'm running. So basically just outputting the different components to the oxygen budget so that you can try to disentangle what some of the physical and biochemical controls are. And I'm particularly interested in hypoxia for the continental shelf of the Northeastern Pacific.

24:48 – Amber Holdsworth
Thanks.

24:51 – Inge Deschepper
Thank you, Amber. All right, next is Elise, I think.

24:58 – Elise Olson
Hi.

25:00 – Conference Room (Elise Olson) – Speaker 1
So I just thought I would share a little bit of what we're working on here in the Climate Modeling Division, which now includes both CCCMA and the Subseasonal to Decadal Prediction Group. There is ongoing work to include the you see in the CanTODS domain, which downscales from the fully coupled global CanESM to the smaller domain shown in the lower left, providing atmospheric forcing, ocean boundary conditions, initial conditions optionally, and river forcing. And this CanTODS Canadian Three Oceans downscaling system is ultimately going to be used for downscaling projections as well as predictions. And we're testing and configuring BGC options right now, including CMOC and CanOE. So I've shown a plot, a preliminary example of what those fields can look like, This is an example from the downscaling system run with CMOC. And there are a lot of people contributing to this project from ECCC in the Climate Modeling Division (CCCMA and S2DP), as well as DFO and the University of Alberta. And I've been doing a little bit of the work to combine some of Christian's global work and getting the CMOC and CanOE models running under the sort of new system that we're working on. And I've been combining that into downscaling system that Jonathan Isette, and Natasha and others have been working on.

26:55 – Inge Deschepper
Thank you. Okay, next is, I think this is Tol's. I don't know if maybe Susan Allen is online that could potentially speak for Tol because I was informed that Tol won't be able to make it today.

Jose Valentí

I am from the group, but I don't think I can explain his work.

27:24 – Inge Deschepper
Okay. That's also fine.

27:25 – Jose Valentí
He's basically improved oxygen by, I think, changing some of the bathymetry and probably friction of the bottom too. Yeah. I'm sorry. He also changed some of the set too, which used to be miss zooplankton. I don't know what else I can say about this. Yeah, sorry.

27:47 – Inge Deschepper
No, it's great. It's great. That helps as well.

27:50 – Jose Valentí
I can actually share the preprint from the paper that uses this version. I'll do that on the chat.

27:56 – Inge Deschepper
That would be great. Cool. Right. Then I think the last one is Thomas. I don't know if I said your name right, but...

28:11 – Thomas Guyondet
That's fine. Thomas Guyondet, I'm a research scientist with Fisheries and Oceans in the Gulf region based in Montaigne, New Brunswick. So I guess the southern Gulf of St. Lawrence is our playground. And in this region we have lots of shallow, semi-enclosed, lagoon-like bays and estuaries. In all the three provinces, New Brunswick, PEI, and Nova Scotia. And many of those coastal systems or near shore systems are used for shellfish aquaculture. So that's a good chunk of the applications of the modelling I'm doing is for that kind of aquaculture. And it happens also that in many of these systems, we do have issues with eutrophication, mainly from agricultural land use of fertilizer runoff from the watersheds. And so for tackling these issues, I'm using a couple FVCOM-ICM modelling system. If you're not familiar with that, the biogeochemical part was first developed in the U.S. To look at eutrophication issues in Chesapeake Bay. It has evolved a bit since then, but it's still an NPZD-like model with oxygen. And it's somewhat modular, so you can include or not the cycles of carbon, nitrogen, and phosphorus. And to that, for my own applications, I coupled that with a shellfish bivalve model, so two-way coupling with that, and also with benthic macrophytes sub-models because, The main ones are sea lettuce and eelgrass or sea grass. Sea lettuce, because it's the main symptom we have here for eutrophications, it's very large blooms of that microalgae. And all the illustrations on this slide are from most recent work we've done one of the systems in Prince Edward Island, where we actually have a question related to both bivalves and eutrophication in the same spot. And working in collaboration with Agriculture and Agri-Food Canada, we were able to get scenarios of nitrate reductions from best management

practices in agriculture. And so we forced this model with these scenarios of nitrate reduction. And at the same time, that place was one of the largest fishing spots for oysters in PEI. But I don't know if you're aware of that. Recently, we had two new diseases for oysters. And this system, the Dunk River Bay Deck Bay system is the epicenter of one of those diseases that showed up first in 2024 and since then, the oyster population was completely wiped out of that system. So the modeling we've done was allow us to look at responses of the biogeochemical variables to both nitrate reductions and the bivalve oyster removal from this disease. And this is just an example of a type of applications. We are doing a type of questions we're trying to address with this modeling. Last thing I'd like to mention, which might be of interest for this group, is I have done coupling with a bivalve module under the NEMO 3.6 CanOE configuration, but so far it has only been tested to to make sure it was functional, not applied to a real case yet. It was meant for a project in Newfoundland, but it hasn't been completed yet. So I'll leave it at that. Thank you.

33:43 – Inge Deschepper

Thank you, Thomas. It's nice to see what's happening that's not based off of a NEMO base and all of that. That's fantastic. Thank you for joining. Okay, and then I think that's it for the slides that have been provided. Is there maybe anybody online that didn't provide? Ah, yes, Diane, please go for it.

34:10 – Diane Lavoie

Yes, okay, so yeah, I didn't have to prepare a slide, but basically this last year we didn't do like necessarily improvements, to the model, we worked a lot on habitat characterization for different marine species, projection of habitat studies with the province as well for the water treatment, like trying to determine what level they should put their standard and what is the impact on the Gulf of St. Lawrence. We're also working on (?) migration model with Olivier Riche, Joël Chassé and Adam Drodowski. We're also coupling the Gulf of St. Lawrence model to NEMO 4.2. And yeah, so we also made some development in the last few years, different person made different developments. So this year we're all gonna bring this together. For example, we improved the sediment box, we have atmospheric deposition of nitrogen as well. So we're just going to gather all the improvements together, coupled to NEMO 4.2 and we will also prepare new projection with CMIP6 output. And we might, if everything goes well, what Yujuan presented, we might also see if we could use the output of the Atlantic model for boundary conditions, or at least study more like what's coming from the Labrador Sea and Gulf Stream region. So, yeah, I think that's about it for us.

36:16 – Inge Deschepper

Fantastic, thank you. I think Elise?

36:22 – Kristen Rutherford
Can you hear me?

36:23 – Conference Room (Elise Olson) – Speaker 2
Yes, that's actually Kristen and hopefully you can hear me okay. Yeah, I'm Kristen Rutherford. I'm here at the Canadian Centre for Climate Modelling and Analysis with ECCC and I'm currently working with the Ocean Biogeochemistry in CanESM, which is a global climate model. And so as Elise already sort of mentioned, we have two ocean biogeochemical models in our global climate model, which is CMOC and CanOE. And we also have sort of two active versions of CanESM right now. One is CanESM 5.1 which uses NEMO 3.4, and then one that is currently under development is CanESM 6 with NEMO 4.2 and we're currently preparing that for CMIP7. And so some of the research that I've been doing lately with Neil Sport, Jim Christian, and Elise Olson, is doing some ocean alkalinity enhancement experiments in CanESM 5.1. And with this, we're using CMOC, which is the simpler, sort of less expensive biogeochemical model that we use here. And so the current experiments that I'm doing are sort of simple, more extreme, not super realistic, I guess, experiments where we're adding alkalinity everywhere in the entire surface between 60 degrees south and 70 degrees north. And we're doing this on a high emissions pathway with interactive atmospheric CO2. So essentially changes in the ocean can affect atmospheric CO2. And this is an experimental design set out by an experiment in CMIP6 actually. And so some of the work we're doing is comparing our results with the other earth system models that contributed to this experiment in CMIP6 so we can get a clearer picture of model uncertainty with ocean alkalinity enhancement. So this is just sort of some preliminary work that we've been doing in this area. We have like a lot of other ideas for future more realistic experiments that we can do with the Earth system model to better understand also Earth system feedbacks associated with the ocean alkalinity enhancement. Yeah, hopefully I didn't talk too fast through all of that, I wasn't done on my life together enough to prepare a slide for today, but I do have a talk at CMOS where I'll be talking a bit more about this.

38:47 – Inge Deschepper
Fantastic, thank you, Kirsten. Then there's Jose Valentí.

38:54 – Jose Valentí
Yeah, hello.

38:57 – Jose Valentí
I did prepare a slide, but I forgot to send it. Can I share my screen or is that? Okay. Is it showing?

39:12 – Inge Deschepper
Yes.

39:12 – Jose Valentí

So, besides the physical changes, why am I showing this? I will just show this. Besides all the physical changes that Tal was going to present on the improvements for the oxygen on SalishSeaCast, which is the most from Susan Allen's group, and I'm showing the domain on the left. I also made parallel some modifications. That's why I don't know what Tal did to the model, because we're both working in two branches that haven't been combined yet. But what I've done is a change in the biochemistry. We're using as a base Elise version that is not the current version anymore. And basically what we did is we use the Mesodinium rubrum box, which was already not being used. So it was set to biomass zero. It was not growing anymore. And I've included the trophic bacteria which is now connected as a microbial loop. And the idea of this is that it should improve remineralization by doing it through excretion instead of just a fixed rate. And yeah, this is basically it. I will share someday, hopefully soon, the results of this. The model is already tuned. We've managed to not kill everything else. It was kind of hard. To include a box and not destroy the rest. But after some prioritization and tuning, everything seems to be working. I'm now ready to start running it. So really excited to see how the runs result. Yeah.

40:55 – Inge Deschepper

Fantastic. Thank you, Jose. Would you mind emailing me your slide and then I can put it into the slide deck for the publication afterwards. That would be great.

41:05 – Inge Deschepper

Great.

41:06 – Jose Valentí

Yeah, thank you.

41:07 – Inge Deschepper

Fantastic, cool. Then I'll just share again see let me know if you see it. Thumbs up if you can see it. Great, fantastic. um then uh is there anybody else that uh potentially would like to talk about the work that they are doing and so forth. Okay, right, then we will go on to Elise. I'll hand this over to you.

41:48 – Conference Room (Elise Olson) – Speaker 1

So we thought we would sort of frame the discussion in two parts in a way. First to just sort of talk about some of the things that we in Canada are trying to do with biogeochemical models? What are the goals? And then after that, move on to like, what's the work that needs to be done to achieve those goals? So I have gone through a few of the documents that I'm aware of in terms of stated government research and funding organization goals that can be achieved or contributed to through biogeochemical modeling. I put direct quotes on the slide, so sorry for all the text, but I've added emphasis and I'll

just sort of go over some of the broad patterns that seem to be in all of these efforts. And I would say those are largely understanding climate change impacts on ecosystems, doing earth system modeling and understanding the carbon cycle, particularly applying earth system modeling and understanding processes in northern regions. And there's also a big focus in multiple documents on nature-based solutions, including our carbon dioxide removal, such as MCDR. And then there's an emphasis on understanding climate risks and vulnerabilities to minimize impacts and costs, identifying vulnerable ecosystems, and improving ocean forecasting, particularly in vulnerable coastal regions. And again, the carbon sequestration research comes up in multiple documents. Go to the next slide. So there's also a focus on advancing both predictions and projections. Ocean acidification, a warming, deoxygenation, which can all occur together and contribute to compound extreme events and pollution events. There's a focus on effects on the blue economy or all of the economic interests happening in the ocean, and to enable, again, the prediction and projection of extreme events and environmental conditions. Then there is some mention of incorporating innovative and fast emerging technologies like artificial intelligence and machine learning into integrated environmental monitoring. And I think, ah, finally, I don't think I mentioned fisheries yet, but obviously that's a big one, management decisions related to adapting fisheries, oceans, and coastal infrastructure. So I thought we could pause here. And if anybody has thoughts on additional important priorities or what you think might be coming down the pipeline next, and please raise your hand and let us know. Otherwise, I think we were going to plan a short break.

45:31 – Inge Deschepper

I've got too many things open where I need to find the unmute button. Yes, so we were thinking of that it was a lot of information and give a five-minute break. If people would like a five-minute break, if you can give me a thumbs up or thumbs down, whether you would just like to continue or we can take the five minute break. Give a moment. I see a thumb up. Okay, great. Then shall we come back at 52. So it'll be 10:52 for us. And then for everybody on on that hour side. Great. Cool.

46:26 – Paul Myers

In just your mentioned, there might be people from Newfoundland, so they won't be on 52, they'll be on 22 with their half-hour time zone.

46:34 – Inge Deschepper

Great, thank you Ha ha ha! All right I think um hopefully almost everybody is back um. Great okay there are faces on cameras that helps. um okay uh so just on the break I was thinking a bit about everybody doing their presentations and I noticed that there's definitely different groups are answering some of the questions that have been targeted in the calls from the different governmental or institutions for funding and things, which is great to see. So that

was actually quite nice to see all the different contributions from different people and everything. I've learned a lot and thank you for everybody that's actually all across Canada for contributing as well. So I think after the five-minute break, we're going to wait where's... There we go. Elise, do you want to introduce this? Can't hear you.

52:42 – Inge Deschepper
Wait, nope, there we go.

52:45 – Conference Room (Elise Olson) – Speaker 1
So we thought this part of the discussion could be focused on like, what are the development needs broadly to advance some of those topics. And as we came up with a few examples to hopefully get the conversation started, so please feel free to interject or raise a hand at any time. But the first example is BGC model advances to accurately simulate a response to extreme events and climate change. Particularly, one way this can show up is constraining rate responses in terms of remineralization, primary production, grazing, and mortality due to temperature and ocean acidification. And we have some questions about that. Are responses sufficiently constrained through observations and experimental evidence? Is there needed communication with observationalists on rates that need further work to properly constrain them? And who has the capacity or allowed scope to do that sort of analysis or that sort of experimental work or meta-analyses based on the existing literature? And just as an example, and to have something that isn't a slide full of text, here's a figure from Archibald et al, 2022, a paper that looked at differential responses in productivity versus grazing and mortality, or I think, sorry, productivity and respiration in terms of if their rate constants are different, what are the implications of that? Which they showed had some potential opposing effects on net primary production versus biomass. Has anyone here done any work related to that or have any thoughts on what steps might be useful to further constrain it?

55:04 – Conference Room (Elise Olson) – Speaker 1
Diane?

55:06 – Diane Lavoie
Yes, I just want to say that there is a Martine Lizotte at the Maurice Lamontagne Institute. For the last two years, she's been working on the impact of ocean acidification on phytoplankton and zooplankton and grazing etc. So she will compile the results of experiments this year and we will include, depending on, you know, what's the outcome on the rates, the impact of ocean acidification in the model on the grazing rates and growth rates, etc. So there's going to be some information on that coming up.

55:59 – Conference Room (Elise Olson) – Speaker 1
Thanks, that's very exciting. Amber?

56:07 - Amber Holdsworth

Hey, yeah. I think the answer to your question there, our response is sufficiently constrained through observations and experimental evidence is no. And I think there's probably a lot of things. But one of the things that comes to mind is an example from the Salish Sea projections that Natasha and I were looking at, mostly Natasha. So the diatoms in the Salish Sea, the way they're set up, there seems to be this sort of upper temperature limit after which they're not as happy. And I think it's like 25 degrees, if I'm remembering right, or around there. We don't necessarily have confidence in that. And in particular, once we project the future, it causes the diatoms to want to shift down because it's so hot near the surface. And so we're hesitant to interpret too much into that because we don't know that it's correct and we're not really in a position to figure it out. So just an example.

57:24 - Conference Room (Elise Olson) - Speaker 1

I think that's a very good example of where we need to constrain these rates better.

57:30 - Amber Holdsworth

Yeah, and maybe even like the functional forms that we use to represent them too, beyond just the rates.

57:41 - Conference Room (Elise Olson) - Speaker 1

Yeah, definitely.

57:44 - Inge Deschepper

And have you been able to like communicate with observationalists or like we're seeing this in the models or because I know that it's we usually ask observationalists for information but I think the communication back sometimes is not as effective maybe and do you think you've had some communication back?

58:17 - Amber Holdsworth

I haven't directly, I know, so this is in the SalishSeaCast model, which is the model that Susan's group develops. And I know she has, and I don't think she's here to speak to it today. But I know, I know she has to some extent, I do find that sometimes a bit of a barrier is that when I have talked to observationalists, they want this level of complexity that is just simply not realistic in our models. And so, yeah, I don't know, maybe there, maybe some more discussions where we tried to come together on, you know, making them understand more what we need and then getting from them the bits of information we need. Like, that might be the way forward on some of these things.

59:03 - Inge Deschepper

Agreed. Yes, I've also had some experience where I've spoken to observationalists and they almost, as you said, they expect so much and it's like, wait, wait, whoa. The model can only do A, B and C. And

if you would like it to do that, we do need all of this information to be able to do that and we have to build it. So maybe as you said, like having a workshop where bringing communication with observationalists and biogeochemical modelers of all different types coming together might actually be beneficial. Diane?

59:47 – Diane Lavoie

Yeah, I just want to comment that even if people observe in the field that there's a decline in diatoms, let's say with warming, they might not exactly know why. Like, is it the growth rate that's affected? Is it warming increase the stratification? There's less nutrients coming up, et cetera, et cetera. So that there might be many causes. So in the model, we can pinpoint what's the cause, but in the field, it's more difficult.

1:00:26 – Conference Room (Elise Olson) – Speaker 1

I think that's a very good point. And also, another aspect of it is communication. I think even among modeling groups, keeping in mind what development has been done for and how it should be, how it needs to be modified when you apply it in a different context.

1:00:53 – Inge Deschepper

Yeah, Nadja.

1:00:58 – Nadja Steiner

Yeah, I just put a link in the chat that's a paper we wrote a couple of years ago for sea ice biogeochemical modeling, like essentially a paper that says, what do we need as modelers from observationalists, but then really going through like, why do we need rates instead of the other, or in addition to like amounts of phytoplankton, how do they link into the model? How do they go in the model? What kind of information do we need? What kind of anterior information do we need, but also what is the role of sensitivity studies to constrain rates? What is the role of model intercomparisons to constrain rates? So while it is written for sea ice biogeochemical modelling, like the general idea is the same. And I think it could be of value for this discussion.

1:01:58 – Inge Deschepper

Definitely. From the talks and the information provided, I guess maybe Antoine, if you can maybe speak on your experience of working with observationalists for sea ice, I know it's sea ice biogeochemistry, and maybe your experience with that and how beneficial it has been and whether there's been a good exchange back as well.

1:02:30 – Antoine Haddon

Yeah it has been very beneficial and I think the the main issue is that it has to like it's a it's sort of a back and forth and it sort of takes time it took time to sort of establish I guess maybe like a common language as well like it that's where you kind of understand

that you're not thinking about the things in the same way and so I think it was really quite important just to kind of go and have regular meetings over the course of like, almost two years, really. And yeah, just going back and forth. And, I mean, yeah, going back to them, like, there's a few bits and pieces that I found, you know, I found like, an example is that I'm finding the nitrates in sea ice can vary quite strongly, even within a day. And so that would sort of have some implications on how you do measurements, right, depending on what time of day you're doing the measurements you might get different values of nitrate and that kind of stuff. So I've sort of suggested that. I haven't really had a definite answer from them, whether they see that as interesting or not. So I think it's, that's sometimes a bit tricky. I mean, we can go and suggest these things, put them in papers. I don't know if they're really very responsive still to these kinds of issues. But it's, I know the outcome of the collaboration has been really positive, and I think they want these observationalists want to keep on working with us. I think they really enjoyed the collaboration and we're going to keep on going forward for it. So it's, I think it's like any collaboration, right? It's something that needs to be built sort of with time and you have to keep working at it, I guess, in a sense, right?

1:04:13 – Inge Deschepper

Right. Yeah. So I guess potentially building those links would be, and starting to build those links to see if we could have those conversations would be great as well. I guess also on that is, I know that particularly within the government, the research that you do is quite constrained on the things that wants to be, that the government says. I guess, unless I'm wrong, I could be wrong, but also maybe if anybody can speak to who has capacity or is allowed the scope to be able to do these testing and meta-analysis and so forth, that would be great. Then we can identify potentially different groups, organizations where we can collaborate together to be able to achieve things. Amber?

1:05:19 – Amber Holdsworth

Yeah, I think the scope of things that are under the purview, I mean, as Elise pointed out, she was like, is there anything else? That is very broad. So I think, actually, the scope is quite broad. And it allows us to do a lot of things. And I think that your second point there about capacity is really the crux of the issue for everyone right now. We just don't have enough personnel to work on these kinds of development issues, because there's also a lot of applied issues, right? Analysis that we want to do. And there's just so many other pieces that development takes time. And so, yeah, I don't know how we address this issue of capacity. Because, yeah, even if we can get all the observationalists together and work hard, which I think we should try to do, it does come down to a bit of a capacity issue. And how do we then take that and run with it?

1:06:16 – Inge Deschepper
Definitely.

1:06:17 – Amber Holdsworth
Or at least that's how I kind of see it. Because I mean, I think there's a lot of really interesting kinds of things we could be looking at.

1:06:31 – Inge Deschepper
Yes, that is very true. Anybody else? Nadja?

1:06:43 – Nadja Steiner
Yeah, I think, I mean, just adding to what Amber mentioned, I think that, I think over the years we actually have seen and it's pretty clear that we need to merge like the observational and modelling thing. And we need to do it in a way that we don't drive the observationalists away by having communications mixed with that are very technical and model specific with the meetings where we have, where we actually talk about components where we need the observational input. So I think if we can create working groups that have, even though they're modelling focused, that say you meet three times just with a modeller, and then the fourth time you meet with the observation people and focus the discussion really on, oh, what are these discussions? The example that Antoine brought was from my perspective, and I've been trying to merge and work with or emphasize the need for observationalists and modellers to work together for many years. That's why we wrote that initial paper from the sea ice component. But I think that was probably the most successful and most fun collaboration because it was really like everybody was excited about how things worked. And of course it helped that Antoine was quick in adapting what information he got from the observationalists, putting it to the test and then bringing it back. So, but I think that's kind of the interaction we need, but we need to make sure that like we have those discussions very focused and not them with like, Oh, there's all these technical boundary issues that we have to solve to do this and this and this, which is fine for us in a modeling-only community, but as an observationalist, you just start to go and drift aside and eventually don't show up anymore. So I think if we can work on developing collaborations that are cognizant of these different requirements and identify where are the connection points and then have those focused meetings that really talk or work around those connection points, I think that would be really important.

1:09:08 – Inge Deschepper
Fantastic, thank you Nadja. Okay Thomas?

1:09:14 – guyondett
Yeah I just wanted to bring a piece of information that is that DFO is currently going through the review of its monitoring oceanographic monitoring programs and that's one thing that we are trying to push

for is that The integration between modeling and observation gathering is actually more integrated. And I don't know what the future of the monitoring programs will look like, But that's one aspect we try to include more there.

1:09:59 – Inge Deschepper

Well, that's good to know that there is a push for it, hopefully. Crossed fingers there's a good result that comes out from it as well. Yeah. Anybody else? Nadja?

1:10:22 – Nadja Steiner

Sorry, me again. Just one more comment. And this all comes from the sea ice BEPSII community, because we've been working on that a lot. But one of the other things that we are trying to do is when we, for example, do data collations for whatever, sea ice chlorophyll in the Arctic sea ice is to always see like can we add like a paragraph on how it is linked to modelling or how this can contribute to modelling so that like people who do the observation start to get better information on okay what is actually helpful and we've seen that over time that things like I just recently reviewed a paper and I'm not going into details because it's not published. Oh no, it's actually a discussion paper, so it doesn't matter. So it was about DMS and methanethiol in Antarctica, but they provided information that then said like for modellers, these rates we observed or these ratios that we observed might be useful to include or something like that. So that when writing and like a very observational focused data paper to be aware of what kind of information from this summary would be useful and then phrase that in a way. And that way, often it can help to even add an additional analysis or add an additional calculation that would then be helpful for the model. So if you can communicate that that need is and support that need by having a model or going over a paper and say, oh yeah, if you can add this, this would be really helpful. I think that would also be a really good contribution.

1:12:08 – Inge Deschepper

That is very useful. Thank you. Yes. Jim?

1:12:14 – Jim Christian

Yeah, thanks. I think what Nadja said is really important, and I would like to elaborate on that. But actually, I'm going to go off on a completely different tangent, because I put my hand up just at the beginning of Nadja starting to speak. Um, so, but not to take away from the importance of that, but I, I think. When I look back that, you know, I've been in this business for a really long time and there's a couple of things that I've experienced. Um, one was JGOFS in the nineties. Um, and so one thing about JGOFS was, I mean, the sort of, I sort of started my career on the observational side of JGOFS and then moved into the modelling, but then they started what they called the synthesis modelling project. And the way that was done was, um, pretty naive in hindsight that they, you know, spent millions of

dollars, at least in the US, JGOFS, they spent millions of dollars on these process study cruises. And then they collected a whole bunch of data and then they said, okay, now we're going to bring in the modellers and give them the data and see what they can do with it. Right. As opposed to actually consulting with the modellers on the experimental design before they spent millions of dollars on these process study cruises. So there was a lot of missed opportunities to, you know, on on those cruises to address the kind of questions that Amber's talking about, right? Like, is there really a hard cap on diatom growth at, you know, x degrees C or whatever, just not really. I mean, they called them process study cruises, but they didn't do a lot of experimentation on processes per se, right? So from the modeling point of view, like, well, like, you know, what's the half saturation constant for nitrate uptake, right? I mean, it would be nice to have some experimental work done on that, but instead they sort of, they went out with a mental model of more of a sort of a kind of flow network model, you know, it's like, okay, we'll just measure as many pools as we can. We'll measure as many rates as we can. And then we can calculate all the others to a reasonable degree of certainty, which isn't, you know, it's not a bad objective, but from the point of view of process modeling, you know, doing actual experimentation on some of these ill-constrained parameters that go into the models would have been a lot more useful, and they really, really missed an opportunity to do that. I guess, and, you know, to be fair, the synthesis, Synthesis and modeling phase of JGOFS actually in the end turned out a lot better than I think people anticipated at the beginning. The first year or two it was not, it was looking a little shaky, but it actually ended up producing a lot of really good science. I guess, you know, the other thing that I experienced some years after that was I sat for three years on an NSERC grant selection committee and I think it's really important to think about this in the sense of what kind of science gets funded in Canada. If you're an academic, you want to sell your research program to those grant selection committees. These grants selection committees are really broad, right? You know, there's, you know, oceanography applications are, you know, 10% of the total. And, you know, there's one or two oceanographers on a committee that has a dozen members. So, you know, you really have to sell your program as being cutting edge, being innovative. And also, it's a lot more, like, it's a lot more constrained than it used to be in the sense that you almost have to you know, to get funding for students, you almost have to state in advance what each student is going to do, which leaves less scope, I think, than there used to be for just sort of free form experimentation in the course of a PhD program. And anyway, I just like I'm thinking about like the kind of experiments that would, you know, nail down some of these processes that we're trying to nail down a little bit better. And I think it would actually be very hard for somebody to proposing to focus on those sorts of problems to actually get through the gauntlet of a discovery grant selection committee. Something to think about.

1:17:05 – Inge Deschepper

Thank you, Jim. I think that's very useful information, especially for me as an early career scientist, it's good to have this information. I guess, Elise, you had your hand up first.

1:17:26 – Conference Room (Elise Olson) – Speaker 1

Oh, one aspect of this that I think is really interesting and seems to be kind of a hot topic sort of on the observational and theory side, is what is the role of adaptation on different timescales in determining these effects? Like for instance, on what timescales can we expect as conditions change for evolutionary adaptation to be able to lead to changes in rate responses. But also at the same time, there's been a lot of research going on into things like phenotypic plasticity, where organisms are able to respond on smaller timescales with their existing genome. And what timescales can that happen on? And what are the trade-offs? And it just seems like there's so much research going into that right now. Is there a way that we can either leverage that to take advantage of it, to bring it into models? Or is there some way that that research could be shaped to better inform models?

1:18:45 – Inge Deschepper

Yes, that's definitely a great point to make. Jared?

1:18:56 – Jared Penney

Yeah. I feel weird asking this because I think I should know the answer, but do we know if people are still doing lab and like bag experiments on getting phytoplankton growth rates and things like that. And this kind of speaks to what Amber brought up about the temperature dependence in the Strait of Georgia there. If it's the same biogeochemistry that we're using, I think it might be, like that's based on a paper from like 1976, where they did some experiments off of *Lyassia syra* and found out how fast it was growing and found a curve that said, this cuts off at whatever. So does anybody know what the lab people are doing now? Yeah.

1:19:42 – Inge Deschepper

Elise?

1:19:46 – Conference Room (Elise Olson) – Speaker 1

Recently, I've heard a lot of proposals for both mesocosm experiments, where you do that sort of work in a natural setting, as well as laboratory experiments exposing organisms to different treatments, but that tends to be in a culture rather than an ecosystem.

1:20:12 – Inge Deschepper

And then also from what I know from, I know at Université Laval in the Takovec group, they do experiments, but it's also very dependent on the phytoplankton that they can keep alive in the lab. So it's maybe

not the groups that's maybe being seen. And particularly, there's a focus more on the Arctic things, if I remember correctly. But I know they're still doing experiments. But I think there's been a big shift into more sort of light responses, rather than temperature responses and things like that. But I could be wrong.

1:20:57 – Jared Penney
Okay, thanks.

1:21:00 – Inge Deschepper
Maybe Diane, do you know, the experiments that Martine Lizotte is doing, is it mesocosm chamber experiments in lab experiments, things like that?

1:21:12 – Diane Lavoie
Yeah, it's lab, but they're collecting the water in the field and bring it back to the lab and then doing their different experiments with that.

1:21:26 – Inge Deschepper
OK, great.

1:21:28 – Inge Deschepper
Nadja.

1:21:30 – Nadja Steiner
I think there is actually quite a bit of that work done, and mostly within a multi-stressor component, like either looking at temperature increases, temperature plus whatever, ocean acidification, and so on. So if you go to a conference and go into a session, those are the things you actually find, is figures of changes in growth rate. And some of them done on-ship mesocosms, where they just take the water out and then do whatever different light, different whatever. Ocean acidification is more in the lab thing, but yeah. Anyway, I just want to confirm that this is still happening, but if you look for it, I think looking, searching for multi-stressor experiment, I think that's where you probably get most responses.

1:22:22 – Inge Deschepper
Thank you, Nadja. Jim?

1:22:26 – Jim Christian
Yeah. I think Nadja is correct that the mesocosm experiments are, you know, still happening, but more in the context of what is the impact of ocean acidification kind of, right? Like I know in Europe, they've done a couple of these like major, you know, mesocosms where they've added, you know, like, let's lower the pH in this one by 0.2 and the pH in this one by 0.5, right? Um so it I mean that could actually be an avenue through which you could get this kind of work funded that again I'm just thinking about like how the funding system works in

Canada and and that before I was talking about individual grants but there's also like network grants um which are actually a larger fraction I think in Canada than they are in some other countries so if you could get through something like you know, SOLAS, you know, SOLAS got off the ground in the late 90s, early 2000s or whatever, and went out and did a mesoscale iron fertilization experiment in the sub-Arctic Pacific, right? So if you could get something like that funded through, you know, the network, some kind of network grant, you know, to say, okay, we're going to do this big mesocosm experiment, and ostensibly it would be about ocean acidification, but you could probably shoehorn in some more process-oriented experimentation that would be hard to sell on its own. And Paul's going to tell me that I'm completely out to lunch.

1:24:07 – Inge Deschepper
Paul, go for it.

1:24:10 – Paul Myers
I'm going to jump in because as I've listened to this part of this discussion, this is no different on the physical side than the biogeochemistry. How to better link with the observationalists, how to have the two groups work together from the start, integration of projects, putting together big network initiatives like Jim was saying. I think, you know, I think this is a broad thing through marine sciences as a whole. I think one of the things we need, and this group is really good that we've got the modelling side, we've got interactions, a lot of people here, there's, you know, from various government departments, there's some at universities. One of the challenges, but I do think one of the challenges we have is the very different funding pools we have for academics, university academics, and government researchers and the challenge in integrating them versus in many other countries where you know you can be at a government research lab like say the National Oceanographic Center in the UK and you could apply for similar research grants, because I think for Jim what you're saying the network stuff is still possible, but they want partners. They want collaborations. And both sides that have to find ways to put up money and integrate in that and a lot of the you know things even on the university space unless they're targeted want partners beyond the federal government because they don't want to consider double-dipping because the federal government's always been funded so I think there's a lot of questions and I think you know in the whole this whole modelling space we're at least touching on it. I think we need broadly to think more how to allow researchers at different places, different organizations, to really collaborate. Have students, early career scientists at the university then go to the government labs. You know, it's possible, but it's not always trivial to get that done, vice versa. Have people jointly on projects, all sorts of things. So this is a much bigger question than just the biogeochemistry, I think.

1:26:17 – Inge Deschepper

Fully agree. Thank you, Paul, for bringing that up. Yes, the best advice I can say for that is yes. I also while while thinking of that, Paul and everybody, I while thinking of the discussion topics and everything, I realized that it's like particularly in biogeochemical modeling we sort of sit in our little bubbles and then we go through a lot of issues with the model that we need to solve and almost creating like communication between different biogeochemical groups so that we can ask questions like I'm having issues with tides has anybody on a smaller regional scale experienced this and they're using tides because I've had an experience where I use tides in the large model but I found out that nobody else uses tides on that large scale and potentially linking with the smaller regional models and their experiences could actually help me more but didn't think of it until we sat down and were thinking about these topics. I don't know if anybody else has had this experience or think that it would be beneficial in the group to bring, find a mechanism that we can communicate and just pop a question into a chat and see if we can bring in those cross cross collaborations. I think, Nadja, you had your hand up and then it went down.

1:28:06 – Nadja Steiner

Yeah, I wanted to bring up something else, so I didn't want to disturb. So I'll bring it up.

1:28:16 – Inge Deschepper

Well, I don't see any other hands, so please go for it.

1:28:20 – Nadja Steiner

OK. Well, one thing that has come up quite a bit, and especially with Canada signing on to the global biodiversity agreement is how to model biodiversity. And I wonder if that is something that this group could discuss or like even put examples out or provide information. Because like even from the funding perspective, like everything's about biodiversity and how to fulfill the biodiversity goals and so on. But we don't actually really have a way to model or represent biodiversity in these models. And I think that could also be like a collaboration between observationalists and like modellers is like, even if we can't explicitly model biodiversity, I mean, we can look at multiple size groups and kind of give that as representation, but identifying what are the characteristics of higher biodiversity and lower biodiversity? Can we represent those in the models? So I thought that I think that is a topic that might be worth like working on or working towards.

1:29:43 – Inge Deschepper

Definitely, I fully agree with that. Elise?

1:29:49 – Conference Room (Elise Olson) – Speaker 1

I think that's a really good point. And one of the big struggles with the type of BGC modeling that we do, and I wonder if I know it's not

very far along right now, and possibly computationally expensive, but I wonder if probabilistic models might be a direction to account for some of that.

1:30:19 – Inge Deschepper
Elise again? No?

1:30:22 – Inge Deschepper
Oh, okay.

1:30:24 – Inge Deschepper
Anybody else would like to give a comment? Thomas?

1:30:31 – guyondett
Yeah, just I found this topic interesting and I think it it goes both ways, or it can go both ways. If you stick to the traditional BGC models, you would want people doing experiments to work at a community level or something that you can interpret in the terms of your model variables. And on the other side is, yeah, find ways to model or to, I think it's fill the gap between biodiversity and functions, or look at biodiversity through the light of functions. I think that's hot topics, or should be.

1:31:27 – Inge Deschepper
Definitely. Definitely. All right. Anybody else? I guess here's some other just questions to think of a little bit as well to keep the discussion going. We will stop in, that is 15 minutes. Yes. Paul, go for it.

1:32:12 – Paul Myers
Okay. I'm going to ask this since I'm a bit naive on the biogeochemical model in space, but I've been interacting with many people on that. The diversity of biogeochemical models. You mentioned here at the U of A, we've been playing with BLING, which is the very simple one from Eric Galbraith, originally four variables that became six when it got the the carbon module, you've been playing with BiGCIIM which came from I guess the Seabird et al (?) module, people of this the models being run in the Salish Sea, people have mentioned CanOE and CanOC(?) and some of the other ones run by various people, you know, ECCC, DFO, this PISCES in the in the NEMO space which has got a gazillion variables and everything else, um there's likely others you know being run with some of the other modules, and in the physical space you know like we talked about on Monday, there's a number of models being run in Canada and I think it was I think it might have been Greg Smith who asked a question or maybe it could have been someone else, you know, do we have too much diversity in configurations on top of, you know, which is really a limited number of models, which is some combination of NEMO, ROMS, FVCOM, FESOM, whatever. Are we, you know, and obviously people need things for specific applications, but are we making it better or harder for

integration and improvement of biogeochemical models in Canada, given the broad number of models, would it be better if more groups at least used a smaller subset, or is there an advantage to using the simplified versus the more complicated, and obviously there are. I know that it's a basic science question but as someone looking at this from the physical modelling side, it seems to be there's a lot more diversity in the biogeochemical modelling space and a lot more uncertainty and a lot more questions, even though we have lots on the physical side, can we talk about, you know, what is the way to go forward for the biogeochemical modeling? Like, again, I mentioned in the discussion on Monday, one of the things to get funding from MEOPAR for this ocean modeling community of practice, we said we'd put together a white paper on the state of ocean modelling. And originally in my naive thought I thought you know I was mainly thinking physics but the biogeochemistry and should we be getting the people working in this space thinking about what recommendations they would make on this topic. I know I've made this very long-winded but I thought I wanted to touch on this broad session and I'd love to hear from some people what from the more earlier career to the people uh who have been around here a long time as Jim said, defined for himself, on this biogeochemical modelling space.

Inge Deschepper

Thank you, Paul. Yeah, I would also love to hear other people's opinions on that as well. As from my side, I, I find each model has its different uses, and it really depends on the question that you want to ask to and then apply it for which model you want to use. And there is some benefit in having a bit of diversity just because each model uses maybe approaches the different rates and biology from different aspects. But again, that is adding diversity that do we fully understand? As well. It is a big question. Yeah, I would love to hear other people's opinions on it because I see the pros and I see the cons as well.

1:36:36 – Conference Room (Elise Olson) – Speaker 1

I'm just going to chime in real quick. I think that Inge said that really well and particularly in the more regional domain, I think there's a lot of benefit to having a local model fit for that particular region, especially a lot of the things that I've read have suggested that in the context of downscaling, when you just move a global scale model to the coastal environment, the increase of resolution isn't often enough to get the accuracy that you want. And sometimes the models themselves need different phytoplankton groups or other modifications.

1:37:29 – Inge Deschepper

Thank you, Elise. Nadja?

1:37:32 – Nadja Steiner

Yeah, I think that, or it seems to me that the less constraint we have

on something, the more diverse our solutions for that become. So like the the less we know about the system, the more different approaches you can fit in to try to reach it. And for the biogeochemistry, which is essentially what Elise just mentioned, is like many of those models even used in Earth system models are developed somewhere locally that's relevant for the nation who is developing. And they may look very different if it's like Northern, Southern, Polar, Subpolar, Tropic, or so on. And so they have their different strengths and then you bring them into an earth system model with some slight attachments so it might work in the rest of the world, but you come from very different components. So just from the biology being, because it's not only like that the temperature is warmer or colder and there is higher or lower salinity, it's a completely different biological component that acts different, has different function and so on. So of course we are having a much wider range of biodiversity. So I mean, I mean, all what I'm saying, it's understandable that it's that way. But I think the more like collaboration we can do to help and observational constraints we get, maybe the less, the more we can constrain that biodiversity, like not biodiversity, the diversity in biogeochemical models.

1:39:02 – Inge Deschepper

Thank you, Nadja. Yes, and I always like to say it's like biology doesn't play by rules all the time. There's a lot of outliers. Right, Jim?

1:39:14 – Jim Christian

Yeah, so I, an example of what Nadja is talking about is that in the regional climate modelling, they had the Africa domain, right, which was like, basically, the idea was that most of the major climate modelling centres are either in North America or Europe or Asia. So, generally, you know, the North American groups are going to pay the most attention to tuning their climate for North America. The European groups are going to, right? So Africa was kind of, was considered sort of a neutral ground that nobody specifically tuned their model because there aren't major centers in Africa. So, okay, let's have everybody do Africa. And that will give them a more objective test of, you know, which model. And, and, and I think like the, the regional test beds model, which I think that I talked about on Monday, so I don't want to repeat everything that I said then, but that was an example of an experiment with ocean biogeochemistry models where we did a similar thing. We took a whole bunch of models and, you know, subjected them to a sort of an objective, if you will, test of which ones would perform best in a system that they weren't specifically tuned for.

1:40:34 – Inge Deschepper

That is actually quite interesting. Could you put a link to that in the chat for me, please? That would be fantastic.

1:40:43 – Jim Christian

Yeah, I will post the link to the RT.

1:40:49 – Inge Deschepper

Thank you. Thank you very much. Yeah, I think that's an interesting discussion about the diversity. But I also think it's that situation where the studies in biogeochemistry is almost, it's, I would say, 20 to 30 years behind in the study and the research versus the physics, the physical ocean side. And we still need to catch up just in terms of observations and those constrainings before we can actually start getting to a point where we can constrain the models itself. Right. Elise, do you have any particular questions that you wanted to ask the group? Because we've got another about eight minutes before we head for the break, the health break.

1:41:45 – Conference Room (Elise Olson) – Speaker 1

How about, do people have leads on constraining biogeochemical inputs? To oceans from rivers?

1:41:58 – Inge Deschepper

Yes. Yes. I guess so I could talk a bit about the stuff that's sort of starting a little bit at the University of Manitoba, speaking with a couple of people, particularly from the carbon interested groups for Hudson Bay, James Bay, is that trying to sort of compile efforts to even just get sort of like watershed levels of nutrients and then providing that information either on like a seasonal scale or a monthly scale. And then we could apply that, but then do the traditional thing of the river runoff that we provide is going to add also to the variability, the seasonal variability. But that's sort of like right at the start of, of, of trying to, to bring in the nutrients. Um, uh, I think Paul might talk about, uh, nutrient modelling from rivers.

1:42:59 – Paul Myers

Well, yeah. So on the physical side, we've been working with a group, there's a group, uh, led by Trish Stadnik, who's a Canada Research Chair at the University of Calgary who does hydrological modelling. And they do a lot of work with group in Sweden and run the Arctic HYPE hydrological something process environment model. I can't remember what the Y stands for. Pan-Arctic, and they give fluxes for all the rivers that, you know, it's a distributed model of rivers and lakes and dams and precipitation and that. And they also give river temperature. And they're talking about, we're in interaction with a group in Sweden, adding in a biogeochemical model that looks at what is the, you know, the land characteristics, the permafrost, frost, et cetera, and then using that to at least try to get some estimate of nutrients coming out of the rivers. I don't know exactly how they're doing, plan to do it. I haven't seen the code, but I know they're exploring that. And I know in fact, with Trish, we've got a proposal in to look at sort of pan-Arctic integrated modeling systems. And if it does get funded, she will have a postdoc for several years to work

on the biogeochemistry in the rivers in HYPE. Obviously it's a model, so it will have all the potential issues of any model for evaluating and that compared to, um, observations like from the great rivers or anything, but it's something that at least if it gets funded will be explored in the hydrological modelling space, um, to provide it to the ocean.

1:44:42 – Inge Deschepper

Thanks, Paul. I'm excited for that to come out. Elise?

1:44:48 – Conference Room (Elise Olson) – Speaker 1

Sorry, I know we're getting close to the end, but that's really good to hear about the rivers, Paul, that Kristen has a really good point about something we haven't brought into the discussion yet.

1:44:58 – Conference Room (Elise Olson) – Speaker 2

It's more like a question I have sort of for the group. It's not something I know a lot about, but I'm kind of wondering if what people's thoughts are about AI/machine learning in the ocean biogeochemistry space. Because in some ways, I can see there being fertile ground for using it. But at the same time, we don't necessarily have the observations for training data for doing AI/machine learning. So yeah, I don't know very much about AI/ML, to be honest. I learned a little bit yesterday. I don't know if anybody has thoughts about that.

1:45:41 – Inge Deschepper

Yeah, I think that is a great point. I also learned a lot just this week for AI. I guess the only person that I can think, oh, there, okay, maybe Thomas.

1:45:55 – guyondett

Well, I will just touch on it because, yeah, it's a huge topic, best topic, I guess. I just wanted to make the link with the river aspect. One of the, it's a bit outside of the question, but one of the, I guess, fields where you could use this machine learning methods is for input generation. So the example I had in mind is that example I had with collaboration with Agriculture Canada, where we, it was hydrological modelling to provide the nutrient loading into the system, but it's also computing heavy and that model is very detailed watershed model with land use and everything, the soil type and these things. So we are actually trying to think about some sort of machine learning way to kind of extrapolate or bring that to, for example, a printer(?) and scale to generate inputs for all watersheds. That's one way I see it can be of use.

1:47:17 – Inge Deschepper

Thank you, Thomas. Yes, I think it's also was an interesting question that came up. I think it was on Monday where it was Andrew that brought up that the physical ocean models might not be replaced by

machine learning, AI and machine learning, but what is the potential for machine learning to help us out with all the questions that we have in BGC modelling? So I think it's definitely an interesting topic and also very open to ideas. Heather, I see you've got a comment in the chat, would you like to speak on that a little bit more, give a little bit more information?

1:48:02 – Heather Andres

Sure. I can't say a ton about it. It's not really an area that I know much about, but we've been having memoranda of understanding with Mercator Océan International for the last few years through DFO, and we've had presentations from them the last couple of years on BGC modeling, and in the last two years, there's been specific mention of work that they've been doing towards using machine learning approaches toward that. This past year there was a work on a global BGC reanalysis is what they were talking about as part of supporting that work. So the name of the person who's presenting is Coralie Perrouche, so if anyone's interested in looking up more about that, that might be a way of kind of finding out more what's going on there. I'll put a name in the chat.

1:48:53 – Inge Deschepper

Thank you very much. Great. OK, I think we have reached the end of our discussion time. So we can head to a 15 minute health break for everybody.

1:49:06 – Paul Myers

No, photo first.

1:49:07 – Inge Deschepper

Oh, shoot. Yes. Thank you, Paul. So if everybody is OK to please put on your cameras and then I'll do a screen grab of all the photos and then I'll give a countdown for for smiles okay so I'm on the first page so one two three smile great and then for the second um okay I think some some screens are loading still okay one two three smile fantastic thank you everybody um okay so uh the plan is to come back five past the hour or for Newfoundland I think Nova Scotia as well um thirty-five past the hour to come back. Enjoy your break. See you again.

1:50:16 – Jim Christian

It's unique to Newfoundland.

2:00:37 – Natasha Ridenour

I'll just warn you, Heather, I got some unstable internet warnings this morning. And things are, we're just trying to stay together. So hopefully my internet does not cut out.

2:00:51 – Heather Andres

That's good. I'll play it by ear.

2:00:54 – Natasha Ridenour
Excellent, I'll try to keep moving. So Lisa, if my video stops, you will know.

2:00:59 – Heather Andres
Sounds good.

2:01:06 – Natasha Ridenour
And Inge, did you take host? Okay.

2:01:12 – Inge Deschepper
No, do you, are you able to transfer it or do we have to ask Paul to transfer it?

Paul Myers
Transferring.

2:01:17 – Natasha Ridenour
I think Paul just took it last time for me. Me. Excellent. Okay. Perfect.

2:01:39 – Paul Myers
Yeah, Inge you should now be all powerful host again.

2:01:42 – Inge Deschepper
Yes. I, I have the power. I have the power.

2:01:47 – Natasha Ridenour
I'm not sure how much I enjoyed being the host. It was like kind of stressful. It was like, okay, let people in, trying to focus and yeah.

2:01:57 – Inge Deschepper
It is quite an interesting experience.

2:01:59 – Natasha Ridenour
Yeah.

2:02:03 – Inge Deschepper
Will you guys be okay to to share your slides and stuff and then I can or do you want me to share the slides?

2:02:12 – Natasha Ridenour
I can share because yeah I think I will start and I was gonna do a little I don't know tour tour of the COP website So if we so I'll see if I can I can do that.

2:02:26 – Heather Andres
So, yeah, we talked to Natasha possibly about like stopping it being screen like a share mode presentation mode so we could maybe write

things in we'll see if that works.

2:02:35 – Natasha Ridenour

Yeah, yeah, that's a good idea.

2:02:38 – Inge Deschepper

Perfect. Okay, great. Cool.

2:04:21 – Inge Deschepper

Rightio, I think we can carry on with the next discussion session. So we're hopping into Cross-Institute Coordination, led by Natasha Ridenour and Heather Andres. I'll let you guys take it away.

2:04:46 – Natasha Ridenour

I'm muted. Okay, excellent start. So thank you, Inge. Yeah, so today it's our last session of the NEMO workshop. It is myself and Heather kind of co-leading the discussion on this session on cross-institute coordination of the NEMO development in Canada. And so I'll just start off with kind of, it covers a lot of points that were raised in the last couple of days talking about the challenges and motivation with kind of a full national coordination effort. So, of course, some of the challenges. Each group, of course, basically has their own model. They've spent a lot of time developing, tuning, they put a lot of heart and soul into these model configurations. And each group, of course, has their own goals and deliverables. And I think this is especially the case for government offices such as DFO, ECCC. There are kind of very clearly defined items, products we have to deliver at a certain time. I think maybe some academic groups have a little bit more flexibility. But there is this kind of range of what each model is developed for and what it has to provide. And there's also a range of different resolutions and/or different model components. And this was brought up in both the BGC discussion this morning as well as the first session on Monday. Um, you know, we have, you know, global resolutions down to, you know, tens of meters. And we also have different BGC components, different sea ice components, and then all of the model components that Nicolas had suggest, like adjacent to NEMO as well. Um, however, I think there is a lot of recognition that, um, we do need to be, um, maybe have more coordination across Canada because, and this is all these points were raised at various points, funding is hard to get. And generally pick a combination of these or all of the above. There's not enough people, compute resources, time for testing, throw money into that as well. So there's a lot of work to do and really not enough people or time to do all the testing that we want. But, and I'm gonna focus more here on NEMO, but we are all working on NEMO, or most of us are, and so we generally all have the same NEMO problems. There are certain features of NEMO that are, you can pull your hair out over for several months, and maybe someone somewhere else in the country has already solved this problem or they will be going to solve the same problem in the future. And so I think we can make our work a little bit more efficient that way. So we don't

really don't need to rebuild the wheel. This was also mentioned on Monday. And we generally all have the same goal. We take a very sky high view at this. We all want better model simulations, and we're always working towards newer versions of NEMO.

And so I'll just list some examples of coordination happening now. These are coordination efforts that I've seen from my perspective, and I'm sure there's a lot of coordination efforts happening elsewhere that I'm not aware of, but as I am part of CCCMA, the CCCMA version of CanTODS actually started from previous work from DFO and ECCC researchers. I'm sure they started that work before I even started my PhD. So we were able to build off of what all like the over a decade, I'm sure of work that they have already put in to start our CanTODS domain. We have at CCCMA have shared our 4.2 code online, and I'm going to highlight some of the work Tessa Sou is doing. Tessa Sou was able to get our NEMO 4.2 CanTODS code offline. We did provide boundary conditions and some initial conditions for forcing. And I think there was a bit of difficulty getting the system to work on the GPSE system, but she was able to get the code and has been working on sea ice biogeochemistry since then. And I know this, I don't think was mentioned, but this came up last year that CMOS at the University of Manitoba has developed or is in the process of developing a model analysis package. There were a number of packages developed at DFO and elsewhere that was mentioned on Monday that are also available that I'm not actually sure if everyone is fully aware of, I know UBC and DFO (Institute of Ocean Sciences), have regular monthly meetings on various modeling topics. There is CONCEPTS, of course, which is a pretty, I think, big group in my mind. And they had the prediction systems working group meeting in the fall of 2025 on NEMO upgrades. And as Heather mentioned this morning, DFO and ECCC do have memoranda of understanding with Mercator Ocean International to accelerate model development by partnering with them.

And so I just wanted to highlight, oops, let's see if I can highlight the NEMO COP website, which I've pulled up here. So it came to my attention that we probably need to advertise the website a little bit more. There is a page for the institutions, and I know that there are a lot more modeling groups than are listed right here. But I think this would be a good place to also start with getting to know who people are. There are a lot of new people entering the ocean modeling community in Canada. And I know at least on the government side, it is really hard to find us, which doesn't help by certain decisions the government has made, but it is really difficult to find out what research activities the government is working on as well. So I will just highlight our own page that we spent a bit of time working on. This gives a very broad overview of what we do. We have put in some figures of our current model domains. I am meaning to update this with our CanTODS work, but we do have a link to our CanESM GitLab code. We do have a list of people who work at CCCMA. Also, do not click these links because the government has now taken them down and we do need to replace them. And then we do have a number of papers on some of the CCCMA work. I was talking to Heather yesterday about maybe putting in

some kind of works in progress. So one thing that I am working on is downscaling a climate model river discharge. This would create a higher resolution product for not only for CanTODS, for forcing the regional model, but also for any other modelling group that would like to do climate projections, but doesn't have high enough resolution river discharge. And so maybe sharing some of our big works in progress on this page and sharing what kind of work we do would also help to bridge that gap of connecting people. And so I think that was basically our introduction. I don't know, Heather, if you wanted to add anything or if we want to go straight to the questions.

2:13:57 – Heather Andres

Yeah, so we were, we were talking about kind of a lot of things came up already on the first day. And then again, in the BGC near the end, some of this came up again today. And it's and we kind of were think we were thinking about how you how we might subdivide the information in a way that would make it the conversation a little more useful, because the reality is, it seems like there's a sharing on multiple kinds of levels that we've heard discussed. We're talking about from the model technical kind of sharing to just finding out who's doing what, so who would be the person to contact. So, what Natasha was just showing is one idea that we had as how we might be able to solve that second group of issues if different research groups or modelling groups had a page and then talked about what it was they were working on and who the primary contact person would be for that kind of work, I think that would help address that general, you know, let's get to know each other and know who to talk to kinds of questions. What we're going to talk about next is more that first section, which it might require a bit more kind of brainstorming and dreaming to try and figure it out. Natasha, I was thinking maybe we could just run through the questions and as an overview first, and then we kind of go back and people will have a sense where we're going with it.

2:15:20 – Natasha Ridenour

That's a good idea. Yeah.

Heather Andres

So yeah, go ahead.

2:15:23 – Natasha Ridenour

Okay, I can do it. Yeah. So the first question for discussion, we wanted to get an idea of what are the limiting factors that are currently hindering various groups' abilities to conduct the modeling they would like, whether it's, you know, compute time, not enough observations, et cetera. So just some of the challenges that is kind of an issue with doing the modelling that you would like. The second section, we came up with some possible ideas for sharing and coordinating. What would people like to share or what would people, what do people need to know or would be useful? So we have a few ideas here. Of course, if you have additional ideas, we would love to hear

them. But of course, this goes from like forcing data sets, products, tools, diagnostics, analysis tools, observational data sets, model code base, model configurations, model domains, namelists, model parameterizations and adaptations. So this would be maybe you have your full namelist but say you don't know why a certain modelling group decided to use a parameter set to true versus false and so a kind of an extension of that could be okay and I'll throw an example that we had in the winter is that we had a very strange checkerboard pattern in our sea ice in CanESM as well as in CanTODS. It took us a bit of time to figure it out. We talked to a few people outside of CCCMA. In the end, we had to switch this adaptive elastic viscous plastic parameter to true, and that seemed to solve our issue. We're not going to be writing a paper on switching this flag to true, but it might save someone else a lot of work. So we could just put, say, We have AEVP set to true. Here's the before when it's set to false. Here's the after. And it seemed to have solved our issue if you have the same problem. And so, yeah, that's just an example of that. And then the third question is, OK, how are we going to once we've figured out what we want to share with between ourselves, how do we see this happening? So, you know, a forum. Email discussion list, a quarterly meeting, a shared table on, say, the community of practice website, or a forum, a GitHub organization. So there's a number of ideas. And of course, if you have additional ideas, we would love to hear them. And just as an FYI, Heather and I are looking for one to two action items that we can all agree on. For coordination that we can move forward for this year. Was there anything else you wanted to add, Heather?

2:18:40 – Heather Andres

No, I think that's great. So if we want to go back and then we'll go and we'll start then in a discussion on limiting factors. And the reason we wanted to start here was when it comes to the table, we were hoping to maybe through discussion, kind of identify. We had different columns in that table. We talked about usefulness. The idea there is, which of these would provide the biggest bang for our buck? Which topics would be both useful for a broad range of groups, but also more doable? And so, what degree of difficulty? So, relatively low degree of difficulty, but very useful. It's kind of where we want to start our thinking. And I think some of that prioritization comes from reflecting on what are the things that right now we're facing that are challenges. So that's kind of where we want to start. I know this can this, we could probably talk for hours about what's what's hard right now. But we've set aside what 30 minutes to talk to kind of explore what are some of the themes, what are the common things that are coming out that are the really the limiting factors that you're finding right now in your research where collaboration might be useful. So I'm going to open up the floor. Go ahead, Paul.

2:20:09 – Paul Myers

Part of me wanted to wait. Wanted to hope I was hoping someone else would volunteer to go first. I don't want to dominate discussion, etc.

I'm going to put two Well, I agree with everything in your table, it's relevant. For me the things that jump to mind one is forcing. um Actually as you run high res high resolution models, you know, is a 30 kilometer atmosphere enough when you're running down at a kilometer scale, but do we have high, there are high resolution atmospheric products, but they're often very localized domains. They don't necessarily mesh. River runoff is a huge issue and all its products, melt from ice sheets, time periods, there's all sorts of things in standardization. And that I think that is really relevant. So I think forcing is one of the big things. Um, I guess another is, you know, evaluation, you know, we're switching to NEMO 5, which is great in one sense, but then you have to figure out how to get NEMO 5 to do what you want and have fields you like, uh, which is, uh, a challenge. So there's a lot of things there and those definitely could be done well in coordination. Um, and I'm gonna put one thing I don't think was on your table, but I actually want to add one more. People power, I think that's a limitation. There's always you know, how many people can you get how can you train them? How can you interact? You know, all that.

2:21:48 – Heather Andres
Thanks for kicking it off Paul.

Natasha Ridenour
Yeah, I think I think the people is is probably a big one, it's either there's some groups that cannot keep the people or you have other groups that cannot find the people or get enough people. And so, although we're all, I think we're all struggling with lack of people generally. Stephanie?

2:22:18 – Stephanie Taylor
Yeah, I just wanted to follow up on that as within DF0, it is frustratingly difficult to hire people for any sort of long-term, well, hiring people generally, but even hiring people for extended work. And this isn't really the sort of work that you can just kind of jump into. A lot of the stuff that we do really benefits from having people be around for a while. And so that you can have time to get familiar with all the weird nooks and crannies of the code. So yeah, that is a perpetual problem, I don't see that improving for government anytime soon, but who knows?

2:23:27 – Heather Andres
I'm just seeing in the chat, we've got time and people resources listed by Jared, and the hiring seconded by Michael Dunphy.

2:23:40 – Natasha Ridenour
Guoqi?

2:23:49 – Guoqi Han
Hey, yeah. Yeah, I would like to add something. I think I find it's very difficult now in Canada to find really motivated and skillful

scientists. And they can really sit down and dig into the model and to find out how to improve. Because the model now is so complicated, right? It's not like when maybe Paul and I, we started at that time, you know, the model relatively was simple and there's not much you adjust and it's easy to understand. But now things are very complicated. And so the learning curve is very high. And I think once you learn it, you really need to have some motivation either to improve the feature or seeking your science or developing your capacity in the model. It's not just use, you know, existing features there and they just run and then do some comparison and see how results are. But I think we really need some people to do that. And I really realize there's issues for our recruitment and funding. So this all even makes things more difficult and how we can attract motivated and skillful scientists, you know, modelers to working for us, right? It's quite difficult. And I found something useful to me, maybe if useful, I think if people have made adaptation and as Natasha mentioned, if there's one, you know, specific parameterization actually really works, probably it's not that can be really put into a separate paper, but if it would be well documented and communicated to the entire group, then that would be really useful, you know, for calibrate, like to improve efficiency in the entire community. And yeah, that's, I have actually more important. Thank you.

2:26:20 – Natasha Ridenour

Those are some good points, Guoqi. I'm just gonna, yeah, so I think and we can also separate kind of the adaptations and parameterizations a little bit just because I know like Sarah McDermott, of course, did lots of work on like tuning for sea ice and like she was able to get like a full paper out of it. But then there's so then I think I see there being a space for someone doing a lot of like those improvements to get a full paper out, but then also, yes, for this simple improvement that we're not going to be writing a paper on it, but yeah, to have these improvements to share. Because yeah, I think it puzzled us for quite a long time. And I say us, I was on it for like a month or two. But I think Damian and a few others at CCCMA spent a lot more time trying to puzzle out what was wrong. And then I had a follow up question on the on the training. Are you finding so like, yeah, I know, like recruitment and getting and kind of keeping people is difficult. But are you finding that in maybe the people who are applying for jobs too, do they do they have the skills that you are looking for? Or is there also kind of maybe a gap to between what the skills you're looking for and what, say the the people you would like the people who are applying for the jobs that they have? Is, or are they aligned, and it's just a matter of finding the people?

2:27:56 – Guoqi Han

And Natasha, is this question to general audience?

2:28:20 – Natasha Ridenour

I guess. I guess. Sorry. Yeah. More specifically, general I guess but

yeah I guess I'm asking you specifically because you brought it up too. But if you don't have an answer, that's totally OK. But yeah, is there a gap between the skill set of what you're looking for and what the applicants have? Or is it just a matter of not many people are applying to the jobs, if you have an answer.

2:28:54 – Guoqi Han

Yeah, I think there's... I think there are some gaps in the skill set, and yeah. Especially, you know, probably I've set the standard a bit high, and I want this person, you know, I found a lot of time if this person is technically good, but he lacks some other skills, you know, in the like a leadership, in the, you know, enthusiasm. And so I just found it, I probably I set it back too high one today and I find some person can have all this, you know, three aspects together, leadership, enthusiasm and skill, you know, together. Sometimes I find this quite difficult to have this. Yeah. Yeah. I think I think that's maybe if a young scientist who possess all these merits, he would like, or he or she, would like to find a better place, right? I think, you know, so I just find this sometimes quite difficult, you know, yeah.

2:30:08 – Natasha Ridenour

Okay, yeah, no, no, this is good to know, I think this is valuable information. Stephanie?

2:30:13 – Heather Andres

Can I just jump in quickly on that one? I just want to say I know from our experience, even with people who have the skills, there's because we can't offer anything more than like a casual contract at this point in time, there's no motivation for those people to stick around and it's really hard to, it's really hard to be able to attract those people to apply when that's what you can offer. Go ahead, Stephanie. Sorry.

2:30:38 – Stephanie Taylor

Yeah, that's pretty much what I was going to say, that it's really hard for, we've hired some students about a year and a half ago now, like just co-op students, and the job market is hard and fractured and nobody can, it is difficult to get people to be able, it's difficult to be able to hire people to stick around for awhile. So it's difficult to cultivate the skills. And from their point of view, they're looking at it and going, I'm going to have to hustle and go in ten different directions to be able to find a job to pay my rent. It's not necessarily that people aren't enthusiastic, but the context is bad. And I don't really know how, without being able to offer people some measure of stability, to hire people for long enough to be able to develop their skills and cultivate their enthusiasm, cultivate their leadership. I don't know how to fix that. And again, I don't know that, I don't see that changing anytime soon within government.

2:32:14 – Natasha Ridenour
Some big systemic issues, I think. Fred?

2:32:20 – Fred Dupont
From my point of view, if we ignore the hiring issues in the government in the last years and the forthcoming years, I did notice that it was hard to find true modellers. So I assume that the masters students, the PhD students that Susan supports groups, or you use some of this, well, whoever is doing modelling in one of the academia sectors, they just go outside Canada. After a while they probably wait for a job and they can't find anything and they're probably doing a postdoc then somewhere else or some other research assistant job well or maybe academia in Canada is sufficient to ingest all these people but I found that it's very hard for government-wise to hire so not not stunning this is matching the time matching issue that hiring we can hire people in some very short period of times because we have money but then it's hard to find candidates and other times we just can't hire anybody. So does anybody have an opinion about the brain shortage issue in Canada?

2:33:50 – Heather Andres
Paul, you want to go for it?

2:33:52 – Paul Myers
Sure. I'm going to say, Fred, no academia cannot hire and ingest all these people. There's lots of aspects. One, because, you know, it's interesting in academia, in one sense, we are the exact opposite of the government in that, like, you want to be able to keep people, give them good opportunities and train them and keep going on. In our sense, we want people to come, get their degrees, do good work and leave, but be able to get positions. And that's one of the harder things. I think, you know, this is getting beyond into a much more philosophical discussion. I think one of the big issues for getting enough good people in Canada is, in general, we don't pay our grad students anywhere near well enough. They're paid as students, even though, you know, they're maybe the best students coming out of undergrad. And, you know, things have improved a lot over the last few years. But still, funding is not great. It's not stable. Then you have to try to find a postdoc. You know, you're very transient. You're on short term, non-confirmed funding until you get a position either in a university, which is a small number of people, government, NGOs, industry. I also think students don't think enough about sometimes the other places where they can work and use their skills. But that, again, so, you know, there's a whole, the whole system, I think, has got all sorts of issues of attracting and maintaining the best people, funding them right, getting them to want to stay, but they've got also the opportunities. You know, you could be the, you know, if you don't see whether it's in a university or in a government research lab, if you want to continue research, or maybe, you know, the small number of marine industries, why are people going to want to maintain and do

those things? Um, so, yeah, there's a whole bunch of places, you know, not that I think it's done especially well in any country, but you know, academics research is a challenging one in this space in many ways.

2:36:11 – Heather Andres

I can say when I was doing my PhD. My PhD, I had no idea what was going on in government. I didn't know that modelling was happening in government at all. So I hear you about the lack of visibility. It wouldn't have occurred to me to apply for a job at that time with government.

2:36:31 – Natasha Ridenour

Yeah, I think that's not the first time I've heard that. At CMOS last year, there was a career lunch and a lot of the students I talked to were like, oh, the government does science? And I'm like, okay, so we need to start at ground zero. So there's also like, and I think this is something that CMOS is kind of currently working on in trying to, and like with DFO, and I think this is a lot on Amber's work, but to try and get more visibility for the government scientists because I think there is some, there's not a lot of awareness, I think sometimes, and I think, you know, the students, they come into the university, they see the professors and they're like, okay, this is where, this is the job, these are the jobs that I can see, but there's a lot of other groups that aren't as visible. But yeah, it does seem like, oh, go ahead.

2:37:31 – Natasha Ridenour

Sorry, go ahead.

2:37:31 – Heather Andres

I was gonna say, I was gonna say, if we're talking, like, I think one thing to put bring up here is the question about partnering between government and academia while students are students. And I know that that's been done in various places and times. And I also know that it has its own inherent challenges. But I just want to raise that as a thing if people have experience with that or comments on that.

2:38:01 – Natasha Ridenour

I think I think that's good. I know like right now Paul has an agreement with CCCMA and so we're doing like regional model development right now and I think that's been quite helpful and I think there's been some areas too that you know where there's tools. I'm gonna point to some of the stuff with Enrico, Enrico wants to do climate projections. He does not have river discharge for future projections. I'm attempting to develop a tool to downscale river projections, but I do need some parent data to, of course, we have CanESM, but also some other models. And so I think in that way, there's also a good opportunity there. I can fill a gap that Enrico needs. And of course, then it gets us all working working together,

but I mean, I do come from Paul's lab too, so there's already kind of a pre-existing relationship there. So it's, yeah, I think Paul, you had your hand raised.

2:39:12 – Paul Myers

I was trying to decide if I wanted to comment. You know, there is things, there have been, you know, interactions between university and students at many levels over the years, some places, especially, you know, I know there's a lot of links between UVic students and IOS, Dalhousie and BIO and other places. You know, it's easy at the informal, well, it's reasonably easy at the informal level because we're all scientists, we want to work together. If a student and some government researcher is working on something similar, chatting, sharing some ideas, taking part, you know, events like this are doable. It's getting it formally set up, you know, and exchanges, you know, which I think would be good to have more formal links, whether, you know, there's getting students to spend extended periods of time in a government lab, working with people, seeing what's going on, getting government researchers to work with students I think there's many benefits but there's also a lot of you know technical issues in that for like first what I'm dealing with now at times you know when you know I have you know PhD students want to do their defense and you need external examiners and doing modeling there's many great scientists here doing government modelling here at you know through the government labs. But my university, U of A, goes, oh, they're at a government lab, they don't supervise PhD students, they wouldn't know how to do a PhD defense, so I can't use any of, people say here, as an external examiner, which is, to my mind, stupid. You know, people are PhD level scientists, but it's this lack of understanding between the different groups, branches, and all the technical issues make it more challenging. I've said too much anyways.

2:41:13 – Heather Andres

Are there more comments people want to bring up for this? It's interesting that we've kind of really hit on people as being the main focus and maybe that's not too surprising. I think that's really pointing to a direction. I think given the context of challenges with hiring and with availability of all the skills and things, and maybe the complexity of models and all the different aspects that you kind of have to get on top of when you're doing it. That might be a nice segue to the next component, unless someone wants to bring up something more that we haven't touched on yet. So we'll leave this open for a moment.

2:41:56 – Unidentified Speaker
Guoqi.

2:42:02 – Guoqi Han

Okay. Yeah, I just want to add something following Paul's comments. So about, you know, collaboration between government lab and the

university. So certainly I think that if our scientists, the government scientists can become adjunct professor in university, that's very good avenue right. And I think lots of universities actually, and professors are very supportive of that. So I think in our group, you know, examples we have seen in presenting like in biogeochemical group, you know, the NERGIA and GEEM, you know, NERGIA, yeah, they're all like adjunct professors at UVic. And so supervised students. And I think really, that's really the very effective and efficient way and also very productive way to get our government work done and to training our students and build relationship. So myself, I have been also adjunct professor in Memorial University before and now I think, so we had collaboration with professors can co-supervise students and also jointly have projects from different agencies. So I think that would be very useful. I remember, Paul, I think when early days, you know, we were even together have a project from some mathematical society, right, about doing some finite element modelling and FVCOM modelling. So, so, so, yeah. So I would encourage, you know, our young government scientists to seek more collaboration with the university in this direction. And so you can supervise students and also get to join the project, even some research funding through the university, you know, academic avenue.

2:44:08 – Heather Andres

If I can just pop in here, though, just to say, as of a few years ago now, just in case people aren't aware, outside of the government, that we're not allowed, at least in DFO, to pursue adjunct professorship unless you get authorization. So you have to get permission from management to request that because it's seen as being potential for outside conflict of interest. So just, there are barriers. There are real barriers. Anyway, go ahead, Inge.

2:44:35 – Guoqi Han

Yeah, I think it's, you're right. So it's subjected to more scrutiny now. It's not like before, and we do need a regional director of science to approve this adjunct professorship.

2:44:53 – Inge Deschepper

I just wanted to add that as an early career that had Diane Lavoie as my co-supervisor as an adjunct at U Laval, it was extremely beneficial and being able to have that collaboration and learn a lot from her as well as the team at DFO at Mongeli was fantastic. And I think it's something that if it can be promoted from an early career scientist, I think it was a fantastic way of doing it.

2:45:26 – Natasha Ridenour

Yeah, I think this is good since, I mean, I know I'm not the only early career new person to government who is not an adjunct yet. And I think maybe there's this idea in that's like, okay, that's a nice option, but maybe, you know, there's other benefits that we aren't fully aware of that, where being an, becoming an adjunct would be

beneficial. Cause yeah, I'm, I'm learning a lot here and I have considered it, but then there was a lot of paperwork involved, so I hadn't pursued it yet.

2:46:03 – Heather Andres

Shall we move to the next, the next part then?

2:46:07 – Natasha Ridenour

I think we can.

2:46:09 – Heather Andres

So I'm not really sure how to tabulate this information. Thank you. But what I did was I just flagged with a number so far to say that we've heard from one person in each case. Specifically, we've already heard about forcing data sets, products, and tools as being an area where sharing and coordinating would be of use. And we also heard about model parameterizations and adaptation. So I just put ones in there. If there are topics here that you feel like are really, really, that would be most beneficial for you, please let us know, and I'll start adding up things here. It's also helpful if we can discuss a little bit about the degree of difficulty, because that came up on Monday already, that some of these are gonna be easier to share than others, and I'll try and keep on top of the comments on the side you know, as people bring them up.

2:47:08 – Natasha Ridenour

I've not been following the chat so far.

2:47:12 – Heather Andres

Yes, and I do just want to say, I noticed that there were some comments about the how. In the chat, I'm not going to bring those up yet. When we get to the how, then we'll bring those comments in.

2:47:23 – Natasha Ridenour

So Guoqi is that a legacy hand or is that a new hand?

2:47:33 – Guoqi Han

It's a legacy hand and not a new hand. Okay, I love it.

2:47:38 – Natasha Ridenour

Fred?

2:47:40 – Fred Dupont

On the model code, yeah, I'd be very interested if we could learn from each other and yeah, share as much code as possible so that if we find anything of importance, we can let NEMO Central know about that, some corrections needed, etc.

2:48:12 – Natasha Ridenour

Thanks. Now, to kind of like expand on that, do you just mean like

having the code visible or if there's like features of the code that are causing issues, like I think there's like if I remember though I'm probably going to mess it up there's something with kind of the very low sea ice concentrations that are get weird sea ice thicknesses or something like that, so is it more just having the code base visible or or just having some being aware of okay we're seeing this really strange feature and having that shared amongst the community, if that makes sense.

2:48:57 – Fred Dupont

Well, definitely, if we have a forum to discuss problems, that would help. Yeah. And then also, if you have any connection, if you've done any modification to the code, that would be worth passing along, I'd be interested to hear. I know that we are not very in good position because we share only the code internally in the government, so facing outside for academia is more difficult. But I know CCCMA, they push their code to GitHub, right, Nicolas?

2:49:32 – Natasha Ridenour

I guess Nicolas is online too. It is GitLab, but it's like a mirrored repository. But I think Nicolas probably has more information on that than I do.

2:49:41 – Nicolas Lambert

Yeah, just saying that we're pushing our kind of Git history on the GitLab.com. But we're having a full functional repository on GitLab.com, so that comes with issue trackers and all other features. We're not just using it yet on this GitLab. We're using this internal functionality more on the internal way. But our code is visible, like with the Git history like I said, so we can see the modification made, yeah.

2:50:13 – Fred Dupont

Yeah, we don't have the time much to look into that, unfortunately. But yeah, it would be nice in the future, especially if we, I guess, if we manage to get out of a CICE consortium, we'll have then one FTE that could really be looking into the code more often. OK, thanks anyway, Nicolas.

2:50:37 – Nicolas Lambert

Yeah, yeah. And that was a little bit my point as well is, I mean, we can share our com, but you have all the Git surrounding environments, so you can open an issue on someone else, issue tracker and tag that person. So I think that would be the nicest way to contact each other. So we get in the repository of the team, so right away we know we contacted the right person. So I would advocate to have a kind of a central place like that, even if in our case, it won't be the place we interact the most, like with the issues and all that, but that would be a way that we get tagged and notified of other people's comments.

2:51:21 – Natasha Ridenour
Hatem?

2:51:24 – Hatem Hatem

Yes, I'm just looking to the table. I'm just wondering if there is any room for the machine learning and artificial intelligence within that table. So I'll be more interested to do that and to share contribute.

Heather Andres

I'll add I'll add a line.

2:51:44 – Natasha Ridenour

Yeah, there was a couple of hands that went up and then and then went down. But yeah, did anyone have any other items that? You know they thought would be would be really helpful. I really liked kind of the model parameterizations and adaptations thing that I mentioned earlier that, you know, with this sea ice checkerboarding thing, like if anyone else is seeing that, we have the solution and it's easy to share that we can post a figure of what it looked like before, what it looked like after. And that's just like a simple switch. Are there any, say, data sets that are missing that people need? Because one thing I think I realized in the last couple of days, you have like there's each group has access to various like tools and code that maybe they're kind of unaware of the benefit of that. So once again, I'll bring up the river routing, but you know, like we have access at CCCMA to a river routing model, which, you know, and this is, you know, a global, a global river routing model, which of course, like a lot of groups don't have access to. Even, even the HYPE that, that Paul was talking about, like it is, it is regional. It is currently, I think, missing the Pacific. And then of course, like, DFO has a lot of expertise with, you know, kind of point data, observation, data set wrangling, evaluation, that kind of thing. So does anyone have any? Or if there's tools people are missing? It seems like the code base is a big one. And I think I've added a point to the model parameterizations and adaptations. Hatem?

2:54:07 – Hatem Hatem

Yes. I'm not seeing any ensemble simulations or stochastic approach.

2:54:20 – Stephanie Taylor

There's also relatively fewer people doing ensembles just because they're more computationally expensive.

2:54:33 – Natasha Ridenour

Yeah, I think that might be maybe a more of a CCCMA or downscaling kind of model thing to do. Because I know there was the North Atlantic downscaling system as well. But that, yeah, maybe more ensembles need to be done. But yeah, of course, then you're, it can get very expensive very quickly, I think.

2:55:14 – Heather Andres

There's a discussion in the chat about models versus. So there was a comment about a high resolution in coastal areas as well will be well appreciated. So I made a comment here under the comments, coastal refinement will be very useful. And then Paul made a comment about A-HYPE being very limited to just the Arctic. And then more discussion about river routing, specifically sometimes having the data set and not just the model available is useful for those who don't have the capacity to do the modelling.

2:55:51 – Natasha Ridenour

Yeah, so I'll expand on that. Yeah, right now, it's probably helpful to actually see the comments, but yeah. So the idea, because we have access to the river routing scheme that CanESM uses, the idea right now, which is it's almost fully set up, but not quite yet, is to actually provide a data set too that could be used elsewhere. So once we have that, I'm hoping that we can get it down to like the 1/12 degrees, so it will kind of match the resolution of what CanTODS will be. But of course, it doesn't help for the very, very teeny tiny domains. But, you know, it will kind of bridge a gap. And I don't know if there's some crazy stuff you could do with looking at the future projection and the historical and then doing some math to account for the change in variability and the timing. I've know I've done that in the past with with the Fraser. Stephanie? Oh, you're muted, Stephanie.

2:57:05 – Stephanie Taylor

Sorry about that.

2:57:08 – Stephanie Taylor

So there's a question in the chat about having a high resolution in coastal areas. So is that just like, here is our model grid, and that's it? Or is it here's model grid and here's data products and stuff like that. Because the one problem that we have with sharing large, we've got these coastal and nearshore hindcasts. There's several terabytes. Where do we put it? How do we make that available in a way that is useful for somebody who isn't? But if it's a question just of putting, here's our bathymetry file, here's our mesh mask, whatever, is that useful for people? I don't know.

2:57:59 – Natasha Ridenour

Hatem?

2:58:12 – Hatem Hatem

Yes, it is useful, especially for those doing the drifting modeling, because the shorelines, that's very important when you have an incidence nearby that place. And when you define your shape file, you have to define the range exactly so your points, when you do the simulation, don't be in the dry place instead of wet place or wet place instead of the dry place. So that precision is very, very good one. I think so. It's my point of view.

2:58:39 – Stephanie Taylor

Right. But you still need the data files as well, right? So it's not, it's not a one or the other, and saying like is there a use case scenario where just having just the geometry files just the you know model–

Hatem Hatem

Actually we're we're creating our own shape files in like in-house processing basically basically on the high resolution from the currents but in the future we're looking for something like dynamically because you know the tidal effects and the movement of the waves and just can change from from one place to another, to one day to another. So that's a big, big issue, I think. But I don't know where we can input it and put here in the table. Am I talking about the same thing that you're talking about, Stephanie, or something like that?

2:59:27 – Stephanie Taylor

I'm not sure, but it's still useless.

2:59:29 – Hatem Hatem

Because I've heard you once in another meeting that you're talking about that before, but it was a year ago, I think, I went there. But anyway, we'll talk about that later, if you want. Thanks.

2:59:47 – Heather Andres

I'm thinking we're going to have troubles, unless someone else has their hand up at the moment. I think the answer is all of these things are good. Maybe we can start talking about which of these is more doable with the least amount of work, just as a starting point. Maybe we can start talking about the degree of difficulty part. Do people have comments about that or thoughts about that. Go ahead, Stephanie.

3:00:28 – Stephanie Taylor

So just off from my perspective, diagnostics and analysis tool is relatively low-hanging fruit because we're often using those, developing those in Python or MATLAB, which are sort of self-contained things. So it's sometimes easier to just push the whole thing. Observational data sets are more complicated because they're often not necessarily ours to share. And you run into formatting and all the complications and headaches that come with that. And namelists are straightforward because they're just text files and so yeah, that is. What else... and yeah, I mean, model domains, forcing data sets, things like that, all run into the issue of storage. Where do we put it? Yeah, that's... my two cents on that.

Natasha Ridenour

Paul?

3:01:32 – Paul Myers

Sorry, I hit the wrong button. Observational data sets, yeah, I think that's more challenging in many ways. You know, they're generally smaller than the model outputs that are being, you know, but it's also the question of getting them into a format that's appropriate for model evaluation. And depending, is it the raw CTDE data? Is it the safe velocities from moorings? And we're not necessarily the experts in doing processing, say, doing the detiding of the mooring velocities or other things. So there's additional steps involved in terms of getting, going from observations to an observational product that's appropriate for model evaluation. And again, this gets back to interacting with the observational communities more, I think is important. The other thing in that space is also depending on what you get, you can go to a lot of these databases, CEWS, MEDS before it, there's the ICES, there's the World Ocean, and you can get lots of information. But then you have to figure out, OK, which ones work like at the same time. Can I pull out an exact actual section, etc? There's again, there's all sorts of other things that are make it more challenging than it should be. There definitely should be more work to again integrate in that space. So and you know, and especially as you look at models of different scales, different complexities. It's really important to be able to get and work with those datasets. So, important, and more challenging than we sometimes think.

Heather Andres

Yeah, I know here locally, we had Jonathan Coyne and Fred Cyr were producing a CAS data set, which just made every, like, it was just like you had to go to and all of these profiles from CTD and XPT and all these things were all in a uniform format. All the QA, QC had been done. It was just a matter of finding the location and the time, and that just made model evaluation so much easier. But that was one data product, and there's other types of modalities of data that would need to have, you know, that has not been done before.

3:04:09 – Paul Myers

Yeah, and if I could just add, yeah, and again, that's where, you know, talking with the relevant scientists, you can often get that, but we need the more general one, especially, you know, for you, and that being on the East Coast, you know, there's all the AZMP sections. At one point, I wanted to do some model evaluations. I went to MEDS, the Marine Environmental Data Service, and I asked, they gave me a giant pile of dots for all the locations for the moorings. And I said, can I get the sections? And they said, there are no sections on the East Coast.

3:04:43 – Heather Andres

Yes, well, like I said, well, I can point you, in the future, Paul, CAS, if on the East Coast anyway, you're probably looking for. And the reason they don't have sections is because each is defined relative to the section station. So you need the station coordinates. And once you

have it, you're set. But anyway, that's a segue. Nicolas?

3:05:03 – Nicolas Lambert

Yeah. So on a different topic, I think one of the low hanging fruit that we can already start, it's maybe to have a place on those Git website that we can coordinate. So if we just go on, for example, GitHub and you create a group that is correlated to the Canadian Community of Practice. That could be the first starting point. And then very easily, we just share our existing repository to that group. So, at least we can now understand what the people are doing more on the modelling side. So, like I was saying before, just who's doing what. So, yeah, and just, and there's the documentation that Natasha showed about the like the page of the Canadian NEMO Ocean Community of Practice which is very useful but right now it's under the group of University of Alberta so so yeah just I would like to see something that is not really governmental but not university a neutral place like you're just a group that is then you can attach your existing project um on there on those Git website that can And like I said before, it comes with an issue tracker and then a different way to tag people. So that could be our entry point and it would be very easy to implement, I find.

3:06:27 – Heather Andres

So Nicolas, were you referring specifically to code bases there or were you thinking shareable via that common Git repo?

3:06:36 – Nicolas Lambert

Yeah, of course, these old tools are built around the code base, but that could be the entry point of anything like the discussion you had with the observation on some item you can have one page that discuss just that and then the relevant people just go and find it that doesn't have to be related to Fortran code that it's exactly written you know it can be anything that can be a way to coordinate even discussion that have nothing to do with actual code that are uh just there so that I'm taking a bit further than just uh NEMO and Fortran code, yeah.

Natasha Ridenour

And I think the same could be said for like, yeah, any of the analysis tools, like all those packages and stuff that have been developed, those could all just be like moved, um, like linked onto there.

3:07:23 – Nicolas Lambert

Yeah.

Natasha Ridenour

Stephanne?

3:07:27 – Stephanie Taylor

Yeah. I just, I suspect this is sort of what Nicolas, uh, thinking

about, but within the government of Canada, uh, on the internal GitLab, there are, uh, projects that are basically just issue trackers, and it's meeting notes, discussion on this, you know, can't log into thin link, like that, that sort of thing. So that's very easy to, that's kind of an easy forum setup. And then as we start to get some of these things online and into a shared space, then there's sort of a natural place where people are already looking. Yeah. Just wanted to agree that that's a good idea. Also, while I'm here, one thing I would suggest is perhaps a shorter name or an abbreviation, because it's quite a mouthful and can make it maybe a little less easily found.

3:08:38 – Natasha Ridenour

Yeah, it is quite long when I've bookmarked it. Elise?

3:08:42 – Conference Room (Elise Olson) – Speaker 1

I just wanted to make a possible suggestion for discussion. What if the format of the community of practice meetings was adjusted a little bit so there was only one polished presentation per session, and the rest of the time was more of an open discussion, possibly with some coordination in advance of problems people are having or asking each other for advice. Just a thought.

3:09:19 – Natasha Ridenour

Tahya, since I know she is the coordinator for that.

3:09:24 – Tahya Weiss-Gibbons

Yeah, I was just going to say I like that idea because we could do it themed around whatever the talk is that month. Like I already do try, not perfectly, but I do try to get two talks that are related to help with discussion often. So we could instead have one talk and then have a discussion.

3:09:53 – Natasha Ridenour

I think your video, unless it was just on my side, I think your video cut out a little bit, Tahya. Unless it was just me, because I've had internet issues today.

3:10:02 – Tahya Weiss-Gibbons

Oh, can you hear me?

3:10:09 – Natasha Ridenour

Yes.

3:10:10 – Tahya Weiss-Gibbons

Oh, okay. Sorry. I just got a thing that my connection is unstable. So, um, I was just going to say, I liked that idea, at least of like keeping it more themed. Cause then we could have the discussion section on kind of the general theme that the talk is on that month, you know, like sometimes they're more biogeochemistry or applications

or development or whatever, and then try to have the months then differ a bit more and like have it set based on the talk.

3:10:38 – Conference Room (Elise Olson) – Speaker 1

I think that's a really interesting idea.

3:10:41 – Heather Andres

Natasha, should we switch to the next page, since it sounds like we're kind of moving into the third question? So let's see.

3:10:47 – Natasha Ridenour

I think so. Paul has his hand up. But yeah, I think it's good to move on. But Paul, did you have any final thoughts?

3:10:54 – Paul Myers

I just wanted to add, I don't think there are any rules with respect to the monthly event seminars. If people find them useful, then we should do it. If they don't find it useful, we shouldn't. I think it's, you know, the hardest point I'm going to throw out to help Tahya is getting volunteers, which of course, you know, we're all busy this time. So if someone is willing to talk about some observational data tools, some technical thing, or, you know, and not really just to talk, but lead a discussion on X and someone volunteers to do it, I'm sure Tahya will say, yes and put them in the schedule. So I think anything that people want, throw out and suggest.

3:11:44 – Natasha Ridenour

Okay, that's awesome. So yeah, so with that, because yeah, I think our whole table and list of ideas, I think now there's some clear pieces that are popping out for what are kind of most worthwhile for for sharing. And so kind of the last, the second last point is kind of what does collaboration look like, how should we go around doing this? And I think there's already been some good ideas with having like a GitHub community page to share all of this. So yeah, I think originally, yeah, we had some, you know, forum, I wonder then if maybe the email discussion list, we would probably all get the GitHub notifications anyway. There's also, we originally had this, oh, go ahead.

3:12:42 – Heather Andres

Interrupt, sorry, Natasha, this is where I brought in something, a comment that came up very early in the chat about the forum email list, and I've written it in here, but the comments were that those tend to require work to maintain, and so there was a question as to whether if we wanted to do that, we should just interact directly with the NEMO forum so that it'd be more, we'd have a broader interaction with international community as well. That's what came out anyway of the comments online. Yeah.

3:13:09 – Natasha Ridenour

Yeah. But yeah, I think there seems, at least from the comments we've heard, there seems to be some general agreement on kind of a GitHub place to put the code and have discussions online. Again, we did have this, the suggestion of the quarterly meeting. But of course, if we if we modify the monthly NEMO seminar to have these discussions, then you know, maybe we don't need that quarterly meeting as an idea if we have these discussions in the in the monthly kind of seminar discussion series. Um, did anyone else have any other ideas or things that have not been suggested or support for ideas that have been suggested for how to collaborate to share all the information that we have? Do we have a consensus? Everyone agrees? I have not been following the chat, Heather.

3:14:31 – Heather Andres

Okay, there was a discussion about the community of practice webpage, and then it was pointed out that that is actually linked to GitHub project. And so there's a bit of a discussion about GitLab versus GitHub. We've got, yeah, I think those are the main, oh yeah, and then Jared put in the link for casts and yeah, I think those are mostly other things. And then Tahya also said that she would appreciate, she just echoed Paul's comment about more volunteers for talks and discussion. We appreciate it. Amber.

3:15:13 – Amber Holdsworth

Yeah, just coming back to the whole GitHub question, GitHub versus GitLab. I think you can get a free GitHub organization through universities. And just coming back to what Nicolas was saying, I just wanted to see if, is there any issue with that? Because it's free membership for universities to be able to sign up for the GitHub organization. And then it allows you to create repos underneath that organization. And it would just be public, so I don't see any issue with doing that. That could be a really nice way to create a more central place to do it. So anyway, that's kind of my two cents. We used it for the hackathon, and it seemed quite nice. Of course, these things all take work, right? So that's probably going to be our barrier.

3:16:14 – Heather Andres

That's exactly where we get into the number four, which is, where do we start, and who is willing to offer what for how long to make this actually happen? Because I don't think this turns into action unless we get to the place where we actually have identified who's willing to take on some of these responsibilities.

3:16:39 – Amber Holdsworth

Well, I'm wondering if people who already have some really nice examples that they want to share might be able to put those together on some pages, right? Like I'm thinking of, OK, you did a bunch of tests. And I think Natasha had a nice example that I'm spacing on what it was. Oh yeah, the Arctic.

3:16:58 – Natasha Ridenour
Yeah, the checkerboarding sea ice.

3:17:01 – Amber Holdsworth
Yeah, so I feel like that, you know, it's probably something you guys already have an internal report on, and maybe that could be, you know, easily put onto a Git page. And so if we could try to get volunteers for existing stuff, right? Like not promising to do more, but all you're doing is promising to put up on the website you already have, that could be a nice place to start.

3:17:25 – Natasha Ridenour
Yeah, I think, I think that's a good idea. Because yeah, of course, yeah, internally, we have all this documentation and everything. But of course, the people on the outside can't see it. So and I think it could be a very simple and I mean, I don't know if we need to go into all the details and all the tests and the paragraphs. It's just here, like the solution, like, here's where we started with, this is the issue and this is the solution we found, like a very, and like we could, you know, have a table somewhere of NEMO parameters or have it split up into BGC parameters, sea ice parameters, ocean parameters, or whatever, and just say, okay, under this parameter, and maybe different groups have different solutions for the same problem. So I don't really know how we get around that, but just to have people can say, hey, I found something different.

3:18:21 – Amber Holdsworth
There's commenting. Right, like people can comment, and that's actually where it gets really interesting. But I love your idea that, you know, it doesn't have to be too onerous. Just put something brief up there that doesn't make it too hard for you to actually do, no barrier. And then people can ask for information.

3:18:37 – Natasha Ridenour
Totally. Because, yeah, you can see who wrote it and, you know, tag people or whatever, because I think that's one of the issues is that, you know, on the things that are limiting is time. And so if people feel like they have to put in a lot of effort to do this stuff, then they're not probably going to be able to do it. So just like very brief, here's a problem, this is a solution kind of thing. Michael?

3:19:02 – Michael Dunphy
This really sounds like NEMO Forum material.

3:19:10 – Natasha Ridenour
Yeah.

3:19:12 – Heather Andres
So maybe let's have a discussion about the kind of coming at this was,

is there benefit for us in Canada to collaborate more closely to kind of improve or speed up all of our ability to progress? The reality is that we actually are part of an international community. Are there benefits or reasons why it would be useful to have something focused specifically to Canada? Or should we be instead all just going to the international? So I'll open that up.

3:19:48 – Natasha Ridenour
Nicolas.

3:19:49 – Nicolas Lambert
Yeah. Like specifically for the NEMO forum, I think we should use it even more. Like that, that should be maybe even internally, we say that's the place that we ask question, even if it's only concerning specific Canada domain and all, I think it would be a good way to have more visibility. And this forum, it's not so much use, we won't be drawn into thousands and thousands of pages. There are people asking questions there time to time, so I think we should use this, that it's already implemented. And I'm sure even a lot of us are already following what's happening in this forum. So I'm getting a monthly summary of the question that was asked there every month. There's not a lot happening. We can take some more place there to have more of our discussion and more open question, technical question there. I think it would be beneficial for us, but to have more visibility in the international community as well.

3:21:02 – Natasha Ridenour
Stephanne.

3:21:05 – Stephanie Taylor
I put a link in the chat to the NEMO forum. The one thing I will flag, and I agree that it is certainly useful to be more visible in the international community, but it depends on what scope we're looking for because that's NEMO only, right? And so if there are, I don't know how much, I don't want to say space, but like, if we're developing things that are built on top of NEMO, but are not strictly speaking NEMO, I don't know how much room there is for kind of extended discussions on that. I could be entirely wrong, I don't know. But certainly for people doing modelling, like Thomas doing stuff with an FVCOM (?) model, like that will necessarily make them out of that. I don't know that there's a good answer, honestly, without splitting attention, which is not good.

3:22:15 – Natasha Ridenour
And I think maybe on that too, like, I mean, it looks like from the BGC discussion this morning, like there's a lot of users of CanOE. Right, that is not PISCES. So, I mean, having a location for, you know, the BGC models that don't come with NEMO kind of thing that have been developed in Canada too. So, yeah, but then of course, some things would be related to like NEMO physics would be impacting the

BGC. And so, yeah, I'm not sure, but I see the points, though.

3:22:55 – Heather Andres

Amber has raised another point in the chat. Did you want to mention it, Amber?

3:23:02 – Amber Holdsworth

Yeah, just thinking, yeah, it actually makes really good sense that if it's a NEMO-related code thing that we use the existing forums and not try to create something new. But then, yeah, there are maybe some specific things to modeling in Canada that we wanna combine efforts on and it may not make, that might not be the right place for that. And so, yeah, I was thinking like evaluation data sources, like Stephanne was talking about earlier in the week. And there's probably a whole host of other examples. Yeah.

3:23:41 – Natasha Ridenour

I think one thing too that had not been mentioned, but it was something that, the CCCMA group and Paul's group had talked about too, with, you know, in kind of the parameter space, is there a way we could also combine efforts to do different parameter testing? So one group isn't doing all the parameter testing, but you have kind of a shared group project of parameter testing and, you know, so it kind of gets shared amongst the group because there are a lot of parameters to test. And as we had already discussed, there seems to be a lack of people and, you know, lack of time. And so there could also maybe be space for that as well, or if a group has already done, and then, okay, this kind of goes into the kind of, it kind of overlaps with the NEMO forum. If a group has already done a lot of testing on a certain parameter, like there's a couple of parameters at CCCMA that have been, have been tested and we've done quite rigorous tests on, does that, you know, does it get passed to, to the NEMO forum or, or if it's like say Canada specific domain or something, like, I'm not sure, but, yeah, it was an idea. Paul?

3:25:15 – Paul Myers

You know, I think, you know, it's a good discussion. I think some things will deserve to be on the NEMO forum. I think another advantage for some of the things when having a Canadian-based discussion is advantage for early career scientists. They get to chat with others in the Canadian community. Potentially, they get to see what people in DFO, ECCC are doing. They get there, you know meet people that may you know help with jobs, opportunities, whatever, so I do think you know, even if we you know have certain things go into the NEMO forum and that, communication, you know improve, you know, keep finding that using also a Canadian system, you know, it just has other advantages as well.

3:26:07 – Natasha Ridenour

I also personally find it much less intimidating posting anything

silly that I might on a Canadian focus on rather than something that the world can see as well.

3:26:28 – Heather Andres

I'm kind of getting the feeling that this might be a good place to start from, is this common Git organization, possibly, that we can then open up repos specific to different types of things that we might want to share on, or however it works. And it sounds like there's enough there that is independent of what would be covered in the International NEMO Forum that there's value in doing that. Would people echo that?

3:27:07 – Natasha Ridenour

I think so. I think so.

3:27:10 – Heather Andres

I'm seeing some hands, thumbs up. Okay. Well, look at that. We've got an action item. This is amazing. So there's an action item, which is then to create, or I don't if the GitHub setup that's being used already for this group is already amenable to this. I don't know how the differences in setup are there. But one action item then is to create or adapt GitHub organization to start I guess, to set up for sharing among groups. There's a question mark of who would do that and what kind of information they would need to be able to proceed with that. Then there's also this question about once we have that set up, there have been a few people who have spoken about examples so far where there might be things to share that we could just start with a couple of different things and maybe people want to volunteer something that you're willing to do a quick, like just a brief, we're not looking for anything intense here, but just something brief to kind of start the ball rolling and test out how well this works. Are there any people who would like to volunteer for putting something on this repo?

3:28:49 – Natasha Ridenour

Jared?

3:28:50 – Jared Penney

I am absolutely not volunteering, but I want to be annoying for a second. Do people have a preference for GitHub or GitLab or what's the platform of choice? Do people have strong opinions?

3:29:06 – Natasha Ridenour

I feel like I have accounts in both because everyone, you know, so I have two accounts I have and it's, yeah, I think I have an internal government one and an external one and then another GitHub one. So I imagine I'm not the only one who has that.

3:29:29 – Heather Andres

And, but I don't know if this GitHub organization, if there's an

equivalent in GitLab, that might be a determining difference. Nicolas?

3:29:38 – Nicolas Lambert

Yeah, that's what I want to say. It's in terms of creating a group and who can collaborate and what is free? That's the main question. So I think GitLab, you can have a group, but you're limited in the number of people that can be in the group and keep the service free. So, and I, what I heard that on GitHub, then an organization might be free for university. So that's, that's the main difference, like in the level of the group and what the after that, from the terminal, it doesn't matter. It's the same, but yeah, it's more on the organization part and how many members can be in a group and what are still free when you want to have more possibilities. So that might be the main difference.

3:30:31 – Heather Andres

There's a comment in the chat about GitLab being internal to government. So when we've been hearing about the internal to government GitLab, because there is actually an instance of GitLab that is internal to government. But GitLab, there is actually a public GitLab as well that's independent of that. So that might be where some of that confusion is coming around about that one. Does that help, Fiona?

3:30:57 – Fiona Davidson

Yes, thank you.

3:30:58 – Heather Andres

No problem.

3:31:02 – Natasha Ridenour

Can't have too many Git accounts. But yeah, I will say, I will volunteer to share some of the work that we're doing with some of the CanTODS issues and stuff like that, like the checkerboard thing that I've mentioned previously. But yeah, I don't know if, like Paul, because you are kind of like the lead of the COP, what um I assume it would be either you or someone in your group who would set up the account to kind of start it off?

3:31:45 – Paul Myers

I think obviously, yes, because, you know, because we've got the, you know, the MEOPAR funding and that we would do it. It wouldn't be me because I'm not a Git expert. I'm not going to volunteer anyone publicly here, but I will discuss volunteers later today.

3:32:03 – Tahya Weiss-Gibbons

Okay, so I was just gonna say this is something I could help with too as well.

3:32:10 – Heather Andres

Awesome. Yay.

3:32:12 – Natasha Ridenour

Yeah. Yeah. Okay, I was gonna say yeah, once once it's set up, yeah, I guess send the send to the mailing list and then anyone else who wants to volunteer with me to start filling in some bits and pieces and information we we can. And I would also once again encourage groups to to fill in their kind of institution modeling pages, there is a how to page on the web on the kind of COP website to do that. Just so we Who's working on what? Because, yeah, there is a group. I do know most people on this call, but not everyone. So.

3:33:04 – Heather Andres

All right, and Nicolas has volunteered to help. Natasha, thanks, Nicolas.

3:33:18 – Natasha Ridenour

Excellent. Thank you, Nicolas.

3:33:21 – Nicolas Lambert

And just right away, there's some functionality to migrate stuff. So if you have an existing project, don't start doing by hand or something like that. There's some tool to migrate easily between the different platforms. So, but yeah, we can get some more information on that. Okay.

3:33:38 – Natasha Ridenour

That's good to know. I was definitely going to do it manually. So I will bug you for questions later.

3:33:44 – Heather Andres

And Thomas, you had your hand up.

3:33:47 – guyondett

Yeah. I'm not volunteering. I was still thinking about the parameter testing question, and maybe I'm not aware, but would simple test cases be useful? I don't know if they already exist, very simple geometry with...

Natasha Ridenour

I think they could, like I mean, and I'm thinking there was some work at DF0, um I might be frozen...

guyondett (?)

so not only the code would be shared, but also the inputs and people can actually test parameters on a very simple case, or a couple of cases, Pacific, Atlantic, or anything like that.

3:34:32 – Heather Andres

Yeah, I imagine that would be helpful. If there were going to be a

parameter testing kind of shared initiative, I think there would have to be some kind of agreement on how that testing would be done so that the results would be comparable. Yeah, it's a good idea. Do we have any other people who have, I'm going to go back to the other page myself and just kind of look at it, who have information on a forcing data set possibly? Or I know there's storage issues with that one. Model parameterization or an adaptation that they would like to, that maybe they'd be happy to share? Or, yeah, we've got namelists or namelists, for example, those were also marked as like an easy place to start. Are there any other people who are willing, who have some work towards that, that they'd be willing to add to this Git repo to start off? Amber.

3:35:50 – Amber Holdsworth

Yeah, no, I'm not volunteering or anything. I'm just wondering if this can be a good place for us to add that information that we're trying to collect on the website about, like, what models are even out there? So, like, for example, we have a wharf downscaling over BC for climate projections at a three kilometer resolution that people could use if they wanted to. And I know they have similar products in the East. And so like thinking about atmospheric forcing and all that thing, all that kind of stuff, like maybe just starting to create a list on the GitHub.

Heather Andres

Yeah, that's a good idea.

3:36:31 – Natasha Ridenour

Paul?

3:36:40 – Paul Myers

Yeah, no, I think that's useful for a lot of things. I don't know if you know if people look on the website and you know I'm looking at you know some of the stuff we have done. You know we've got in configuration showing where they are and for experiments we're willing to share, um, we have put a list of simulations and you can click things to get access to namelists and other things, so you can sort of see again because they're small, unlike the rest of the data. So, you know, yes, we took advantage of the fact we built it, so we used our own internal resources. But I think, you know, knowing again, you know, people talk about even beyond running experiments. We've all got experiments we've run that probably are useful to others. Just knowing who's what run, what and what set up, what years, what forcing, some choices, you know, could be of value even if we don't have space to share the actual files. So again, thinking about things in that space is, you know, I think will help coordination.

3:37:53 – Natasha Ridenour

Geoff?

3:37:56 – Geoff Stanley

Just since you mentioned changes to the model code, the main thing that we've done with NEMO at CCCMA, and this has been in the model for a while, but should just mention it so people are aware, is that we have a scheme to adaptively select the Gen McWilliams eddy coefficient. So it's not just a constant value, it adapts with the changing state of the ocean. And something we talked about with Paul actually kind of recently was I'm implementing this thing from a paper by Bob Holmberg in 2013, that allows you to turn off the Gen McWilliams parameterization in regions where the eddies are being resolved by whatever resolution you've got. So yeah, the first part is available. If you go on to our GitLab CCCMA, you can find the code for that. But maybe we can try to direct people to that, if it would be useful for anyone. The other one is hopefully something get to at some point.

3:38:55 – Heather Andres

Is that something, Geoff, that you'd be willing to just put the link and write a blurb for?

3:39:05 – Geoff Stanley

Yeah, point people to it. Yeah. And there's a paper. This is not new. This is many years old now.

3:39:12 – Heather Andres

Sure. Excellent. Thank you. Is there anything else, people? I think we've got a list, and I think we actually have some action items. And so maybe you're just running through those. So we've got someone from Paul Myers' group is going to create or adapt the GitHub organization set up, and then send out an invitation or a link to people so people can become members. We have a request for everyone to complete the institution descriptions on the community of practice website and that's going if type of information you include you could include a list of your model setups, configurations, experiments you've run, kind of thing. We've got a couple of volunteers who are, who have volunteered to share some existing work development that they've done. Once we have on that new Git set up. I don't know if it's a repo at that point, but whatever, set up a Git repo to be able to share that information. I feel like that's concrete progress. I don't know if there are other things people want to comment or discuss or bring up.

3:40:30 – Natasha Ridenour

We have about 20 or so minutes. So I think there's going to be about five to 10 minutes of kind of closing remarks, but if anyone had any last things they wanted to talk about, share, now is the time.

3:40:50 – Amber Holdsworth

I was just going to say a little bit of thought will have to be put into the GitHub organization about how it looks in terms of repos and stuff. And I would probably point to Nicolas, others who are really

good at using these systems to kind of guide us with this.

3:41:15 – Natasha Ridenour

Yeah, I think that's a good idea, because I think if everyone has their own individual thoughts of how it should be, and then it just becomes like a huge potential to become very difficult and complicated to find information.

3:41:32 – Heather Andres

Nicolas, I've added your name, you've been volunteered.

3:41:37 – Nicolas Lambert

Yeah, so what can happen, I don't know if Paul's group agrees, but they can start with the first kind of prototype and I can have a look with a few other people, just have a first look and maybe more comments on the global look at how it does and then we can release it a little bit later to the entire community. Can be something that can happen.

Heather Andres

Thank you.

3:42:03 – Nicolas Lambert

And one comment about that, yeah, there's people that does put that together and implement this system, but there needs to be some commitment of the people to use it. So to like go there and subscribe, of course, but then to be a place where they put their stuff and then they comment and they interact. So because most of the time with those kind of projects, there's a huge peak of user at the beginning and then it crashed and nobody used it. So it seems to be kind of a commitment of constantly maintaining it, but to use it and to be a point where yourself, you use this tool in your workflow.

3:42:47 – Natasha Ridenour

Yeah, I think that's a good point. That kind of reminds me, it was, there was, I think Paul Spence, who I think Paul Myers might know, couple others on the call, like during the pandemic, when, of course, everyone had to work at home, I think the modelling community in Australia, like, they're like, Okay, well, how are we going to get work done? So I think they did develop like a GitHub community. And they were sharing code, people were asking questions. And I think they got a number of papers out of it, too. So there is like, a potential, you know, but people have to people do have to use it to make it useful. So.

3:43:30 – Heather Andres

Yeah. I feel like that there's, there's the steps that has to go into, we see there's an, it sounds like there's an agreement that there's need for something like this, and that there would be value in something like this. And I think this is the starting point to kind of

get it set up. And we'll see if that actually ends up living out. And I feel like that's kind of, I don't, I feel at this point to a priori determine whether that would be the case or not, but we'll see. At least with it set up, then that should hopefully give people the opportunity to take advantage.

3:44:12 – Natasha Ridenour

Totally. And I think too, you know, if it's not working or if people, you know, aren't using it as much as we hope, okay, then maybe we have to revisit how collaboration looks in Canada and maybe we have to find a different solution too. So this is phase one, I guess.

3:44:30 – Amber Holdsworth

And one idea that could help, maybe it's not a good idea, I don't know. But thinking about the seminars, if we have examples being put up there, well, now you automatically have content for a little discussion at the seminars, right? So we could ask folks that have put things up there just to go over it. What did you find, and just briefly explain what's been put on the Git. And that could also encourage people to use the Git more because they could reach out to Tahya and she could say, oh yeah, it'd be great if we could show this new development. Could you also just add it to the Git? So maybe it could be useful.

3:45:20 – Heather Andres

Any other last comments at this stage? Well, thank you, everyone. I actually feel like that was really, yeah, I felt like that was a really helpful conversation and discussion. And thanks for all your participation. And are you okay, Natasha? Shall we hand it over?

3:45:44 – Natasha Ridenour

I think we can hand it over. I can stop sharing because I have been staring. There we go. Okay, on to you, Paul. Or Inge I guess.

3:45:46 – Paul Myers

Okay, I don't have any specific slides for ending. Um, you know, I think this has been really useful and this is, this is why we, you know, we put in this idea of creating a community of practice. There's many common topics. We saw that in every discussion. There were so many common discussion topics. There's so many reasons for collaboration, need for collaboration. There's ways people can help each other. Just having these discussions, you know, they're of benefit. Ideally, that will lead to really concrete things like with websites, Git, sharing information on top of the seminars. So that's what, you know, go for. I think is of value. And then we can hopefully put this together. I think I mentioned when I started the session on Monday among the other things is two things I wrote in beyond the collaboration which I think is developing recently is we've talked a lot also about the observations. And I talked about uh when we put the proposal in we need to have more links with CEWS(?) and other

observational communities. I think that's something we can develop with ideally getting seminars about you know we can have one of the months how you know how up you know what are some of the observations available for model evaluation, and then also have the modelers saying, what do we need in the observations to try to again link those. There's all sorts of things we could do in that space. And I think this also leads to eventually a white paper of the state of ocean modelling in Canada. I don't think we need, you know, I think a lot of ideas have come about. So I think it's going to be of value to many people and thus, you know, move forward.

Um, you know, in terms of, Uh last year we had the first of these workshops. It was done as a hybrid day at CMOS. You know, I think this has gone very well virtually and there's been a lot of things that have come very well with people joining in, especially with cost of travel government travel restrictions and that. But I know Inge and I were having a discussion yesterday I do think some people there have been some people who have talked a lot more than others. There's some boxes we've seen You know, it's just, you know, it's people's personalities, different things. And it may have been different during the early career day, but, you know, I think it would have been nice to have a bit more early career discussion. And that's, I think, easier if some people are in person, you can sort of, you know, chat with each other, different things. So next year, given that CMOS is aiming to be in person again next year, I'm thinking it would make sense try to aim for a hybrid event associated with CMOS again next year, but that's a year away. So we'll have lots of time to discuss that, figure out what's going on.

The other question that got put out, originally we said we're going to do these once a year. They're a time commitment, there's a lot of work involved, et cetera, but would it be worthwhile having a shorter one in six months? Maybe it's just a couple hours, just part of a day, but actually still having a or maybe that's going to be embedded with the suggestions that we're going to put discussion topics in the seminar series because I think there's a the seminar series have been really good but having discussion is also of value. If people want to comment now that's great or if they just want to think about it and then we can we'll bring this up in future discussions they're all different you know their approaches but as long as people are getting something out of it, you know, I think it's worthwhile for the amount of effort, you know, there's effort going in, but still it's positive, you know, there's a lot of positive.

The other thing I want to do before we finish is, as I said, there's effort involved, we really need to thank people who did a lot of work. There's people who help behind the scenes and putting together this event, getting all the advertising, getting the information shared, getting slides set up, leading discussions, which is a fair amount of work. We had people today, Monday, do teaching events in the early career. So I think we really want to thank all of those people because, you know, it takes time, it takes effort, it's significant. I also really want to add one additional thanks because this event, you

know, everyone's put in work, but coordinating, I think Inge's done a huge amount of work as basically the lead coordinator for this event, running around trying to organize and get people to be the session discussion leaders, sort out slides, sort out everything. So again, let's put a great round of thanks for Inge.

3:50:52 – Inge Deschepper

Thanks, Paul. Thanks, everybody. I just wanted to add a note that is like thank you to everybody behind the scenes who helped take notes and make sure links were copied and everything. I greatly appreciate that as well.

3:51:04 – Paul Myers

And we will put up on the forum notes, recordings, all the information that is going to be useful for people, we will make sure we share.

3:51:13 – Inge Deschepper

And I also just want to add that because there were a couple of questions that Paul just asked, thinking of sending out a survey about hybrid, about the seminars, how to use it, the extra, potentially extra discussion in six months. I'll send that out and then just to get a poll while it's still fresh in everybody's head within the next two weeks, hopefully.

3:51:50 – Paul Myers

Yeah, and if any last points for everyone? If not, I will remind you, there is one more seminar in June, so don't don't go into summer mode quite yet. We will have presentations early in June, and then we will continue in September. And I believe Tahya is looking for volunteers from September onwards. Oh, actually, no, the other thing is we have, again, small amount of money to support early career scientists traveling to NEMO– or ocean modeling related events. It could be a Drakkar meeting. It could be a NEMO hackathon. It could be an Ocean Sciences. It could be a CMOS meeting next year. It could be other things. It could also be, because we talked about, where an early career scientist at a university is going to visit a government lab and interact with a government scientist or several for a week or two or something. It's not tons of money, and we've also said we'll only provide up to 50%, so other sources so we can try to make it last, so that funds are available through this fiscal year so even if this if you suddenly encounter possibilities in the summer you know contact us we're not going to go completely to sleep even if there's no seminars and that. I will add the caveat even if you're an early career scientist, MEOPAR's funding may not be used on anyone working for the federal government. I know we've had that one come up. It's just the way funding in Canada works. Okay. If not, and thanks everyone for their time. I know there's a major commitment over the two, three days. Hopefully everyone's learned, had good discussions, et cetera. And yeah, talk to you at a future event.

3:53:51 – Heather Andres
Thanks, organizers. Bye everyone.

3:53:53 – Inge Deschepper
Thank you, everyone, for joining. Greatly appreciated.

3:53:56 – Natasha Ridenour
OK, I'm trying to download. I'll see if it will download the recording first. I don't want to leave the call.

3:54:13 – Paul Myers
I think normally it happens when you click stop or end recording. It will ask you about that.

3:54:19 – Natasha Ridenour
Okay, I should, oh yeah, so I did stop the recording, but now I don't know if it downloaded automatically or not.

3:54:31 – Inge Deschepper
It will take some time. You can email in an hour or two saying it's available.

3:54:37 – Natasha Ridenour
Okay, so I can leave the call and it won't.

3:54:40 – Inge Deschepper
Yeah, it will come out after the fact.

3:54:42 – Inge Deschepper
Yeah, you just need to keep your computer online for a bit because it's like yesterday's which was two hours took about 15 to 20 minutes to download. Okay. So it does take a little bit of time for it.

3:54:53 – Natasha Ridenour
Okay. Cool. Awesome. Yeah. I don't want to like lose like four hours of recording because.

3:55:00 – Inge Deschepper
And I didn't press like any audio recording on my side. So this is important.

3:55:05 – Inge Deschepper
I know.

3:55:05 – Natasha Ridenour
Yeah. Hopefully it's okay. My internet cut out like a couple of times, but

3:55:10 – Paul Myers
Normally it just, you get a bit of blood in that bit, but you know,

from previous things. Okay. My computer says it's still recording So It could be because of switching the host. I may get a copy of the recording as well.

3:55:27 – Natasha Ridenour

But anyways, okay, that would be good If yeah, you also go on cuz yeah, cuz I got because now if I look at the record thing It's like permission to work to record on this computer. So it looks like I cuz I did stop We'll share things once it comes out, okay Okay Thanks. OK, thanks.

3:55:46 – Paul Myers

And now I've got to go into the office.

3:55:48 – Paul Myers

Sorry, Paul.

3:55:51 – Paul Myers

No, I'm going more into the office for the evening event, actually. OK. Talk to you later.

3:55:59 – Inge Deschepper

I just wanted to ask if you guys, I guess it might be good to sort of set up a meeting of sort of how we want to plan from the results of this whole workshop. Maybe next week? Sure.

3:56:16 – Natasha Ridenour

I don't think there's anything big happening for me next week. I feel like there's a lot happening in the next month before CMOS, but yeah, that should be fun. Bye.

3:56:27 – Inge Deschepper

I'll send an email.

3:56:28 – Natasha Ridenour

Talk to you later then.

3:56:29 – Paul Myers

Bye. Bye.