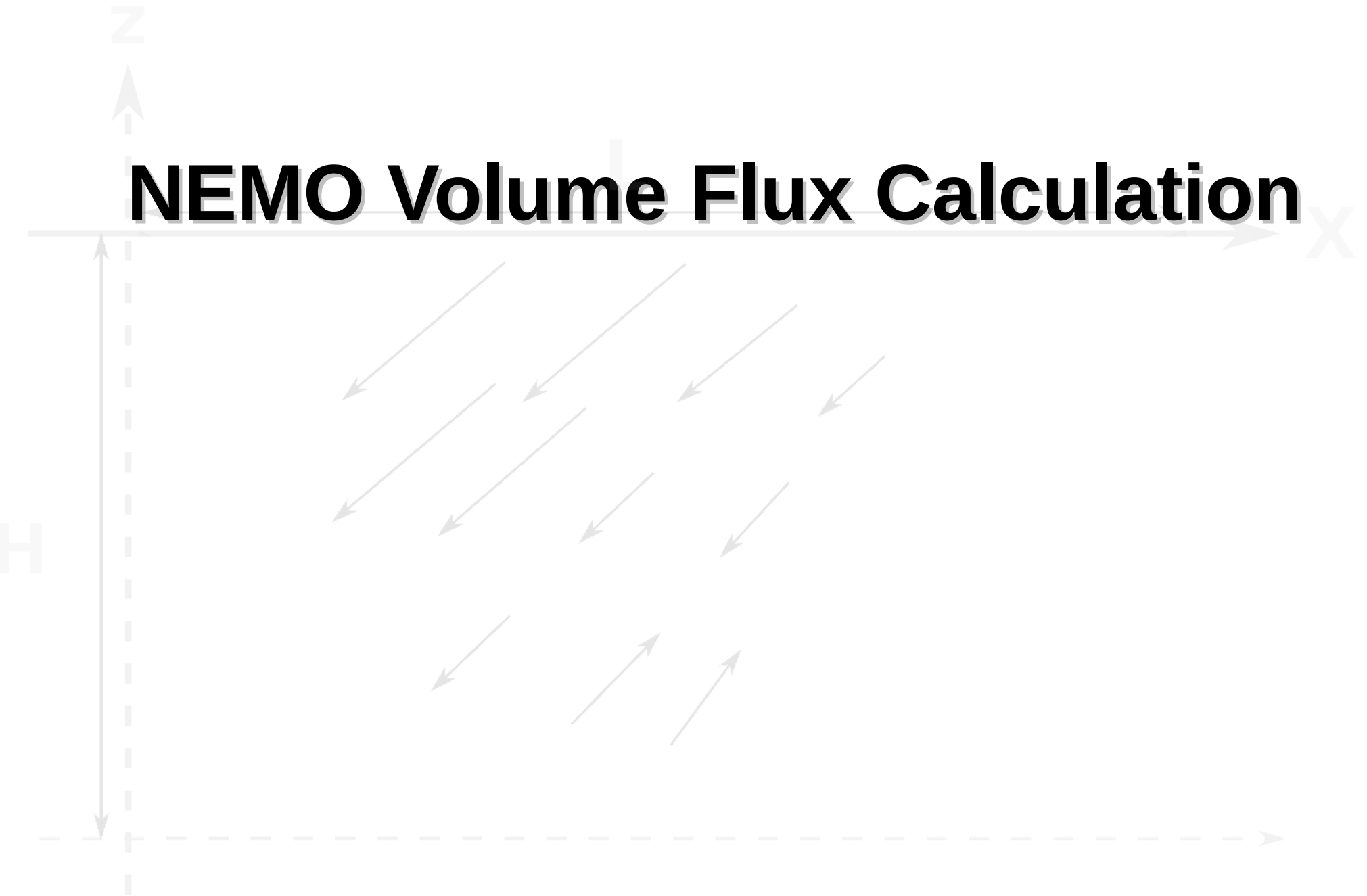
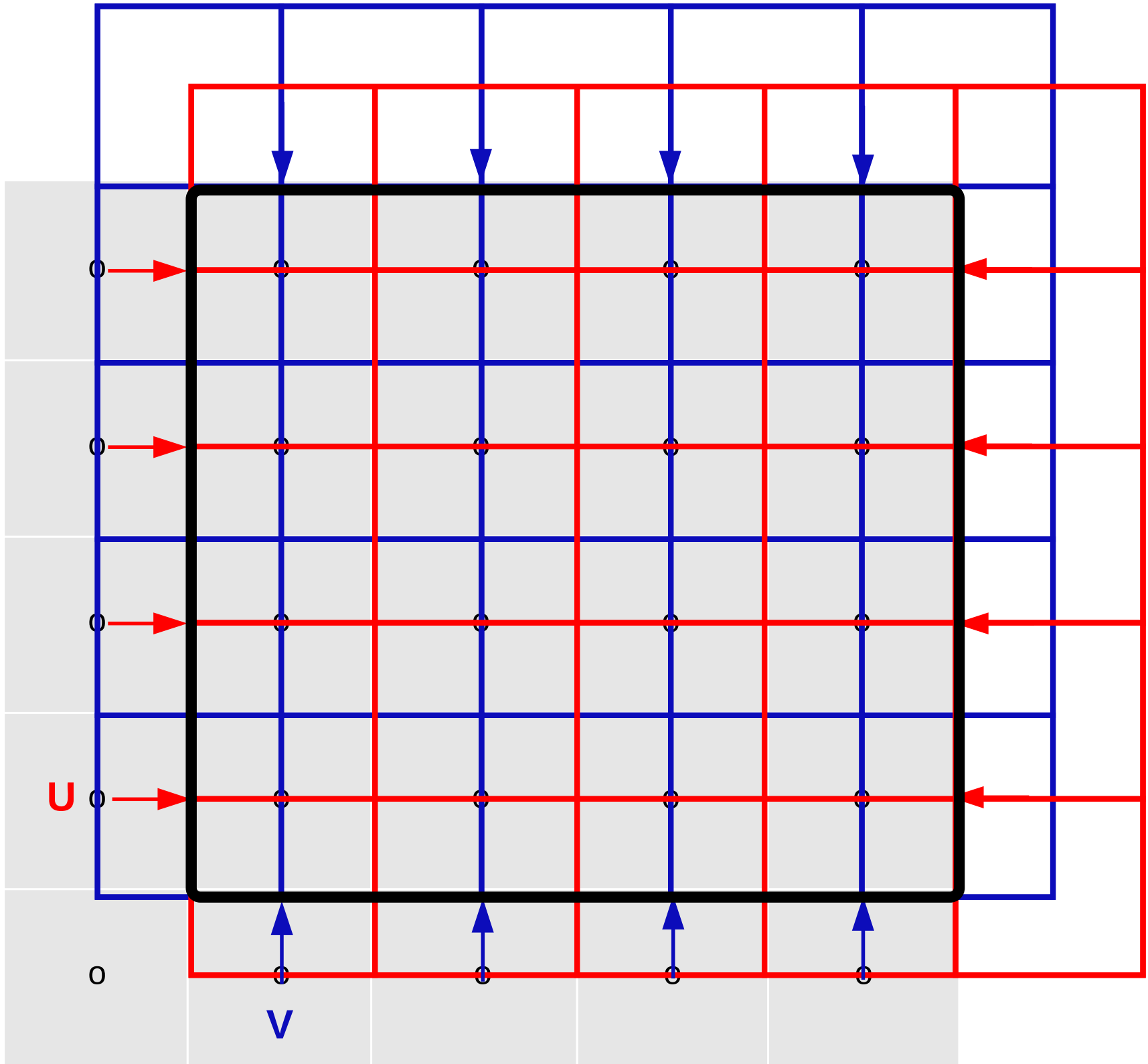
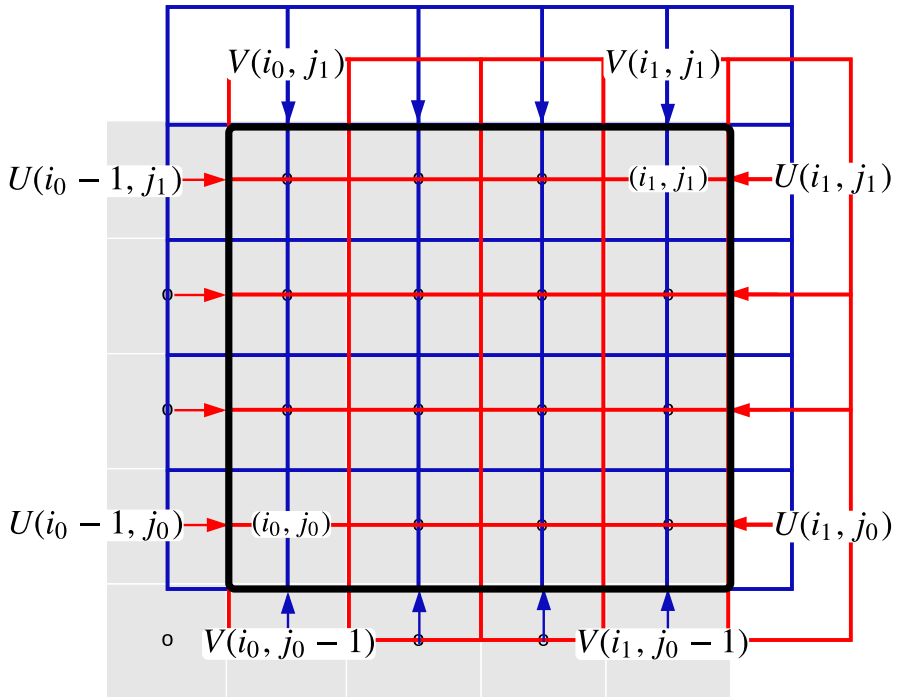


NEMO Volume Flux Calculation







To compute the total flux into region (i_0, i_1, j_0, j_1) :

secLeft:

$$U(j_0:j_1, i_0-1)$$

secTop:

$$-V(j_1, i_0:i_1)$$

secRight:

$$-U(j_1:-1:j_0, i_1)$$

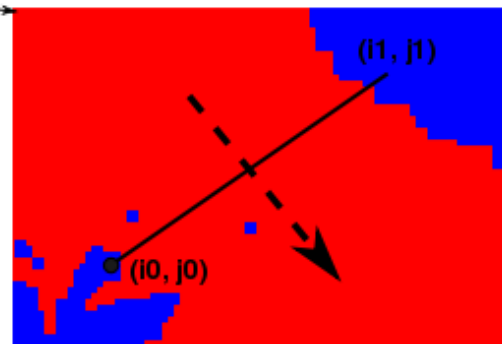
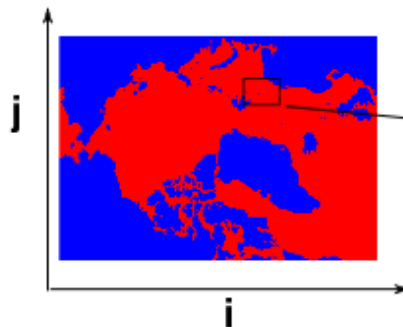
secBottom:

$$V(j_0-1, i_0:i_1)$$

Positive: into the box

section.dat

```
section1-name  
i0,i1,j0,j1  
section2-name  
i0,i1,j0,j1  
....  
EOF
```



F-Grid

if net volume flux > 0
the net flow goes from left to right
net volume flux < 0
the net flow goes from right to left

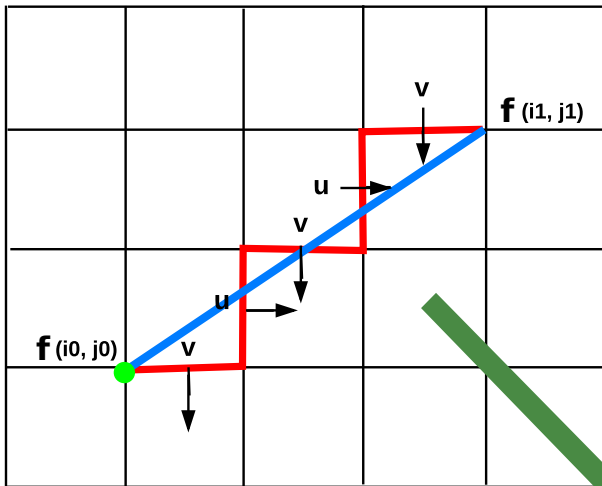
example:

```
gridT file: NAA-EXH18_y1970m01d05_gridT.nc #temperature, salinity  
gridU file: NAA-EXH18_y1970m01d05_gridU.nc #zonal (i-) velocity  
gridV file: NAA-EXH18_y1970m01d05_gridV.nc #meridinal (j-) velocity
```

```
cdftransportizFinalSP -short NAA-EXH18_y1970m01d05 <section.dat
```

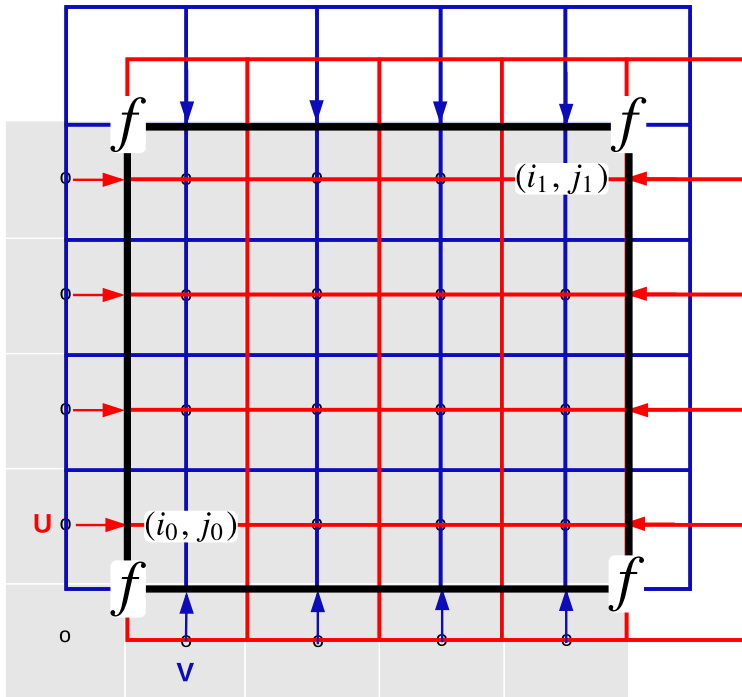
i_0 could be smaller than i_1
 j_0 could be smaller than j_1

volume flux through a f-section



staggered grid





To compute the total flux into region (i_0, i_1, j_0, j_1) :

secLeft

i_0-1, i_0-1, j_0-1, j_1

secTop

i_0-1, i_1, j_1, j_1

secRight

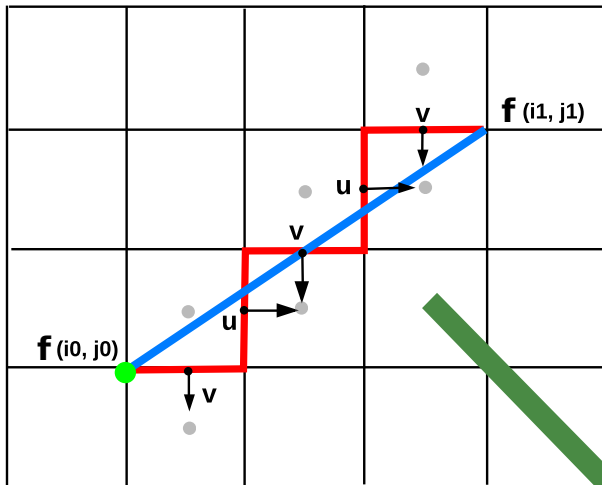
i_1, i_1, j_1, j_0-1

secBottom

i_1, i_0-1, j_0-1, j_0-1

Positive: into the box

tracer flux through a f-section



staggered grid

$$\bar{u} = \frac{1}{\Delta t} \int_t^{t+\Delta t} u(t) dt$$

$$\overline{TRC} = \frac{1}{\Delta t} \int_t^{t+\Delta t} TRC(t) dt$$

$$TracerFlux = \frac{1}{\Delta t} \int_t^{t+\Delta t} u(t) \cdot TRC(t) dt$$

$$= \frac{1}{\Delta t} \int_t^{t+\Delta t} (\bar{u} + u'(t)) \cdot (\overline{TRC} + TRC'(t)) dt$$

$$= \boxed{\bar{u} \cdot \overline{TRC}}$$

$$+ \frac{1}{\Delta t} \int_t^{t+\Delta t} u'(t) \cdot TRC'(t) dt$$

$$\left[+ \frac{\overline{TRC}}{\Delta t} \int_t^{t+\Delta t} u'(t) dt + \frac{\bar{u}}{\Delta t} \int_t^{t+\Delta t} TRC'(t) dt \right]$$

zero