Static files description

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Variables description

3 types of variables:

- scale factors: the ‘size’ of grid cells
- coordinates: the positions of the grid cells
- mask: distinction between land and ocean.

Available files and variables

Product on standard grid (PGS):

- **« XXX_coordinates.nc »**
  - Scales factors variables: e1t,e2t,e3t
  - Coordinate variables: longitude, latitude, depth
- **« XXX_mask_bathy.nc »**
  - Land-ocean mask: mask

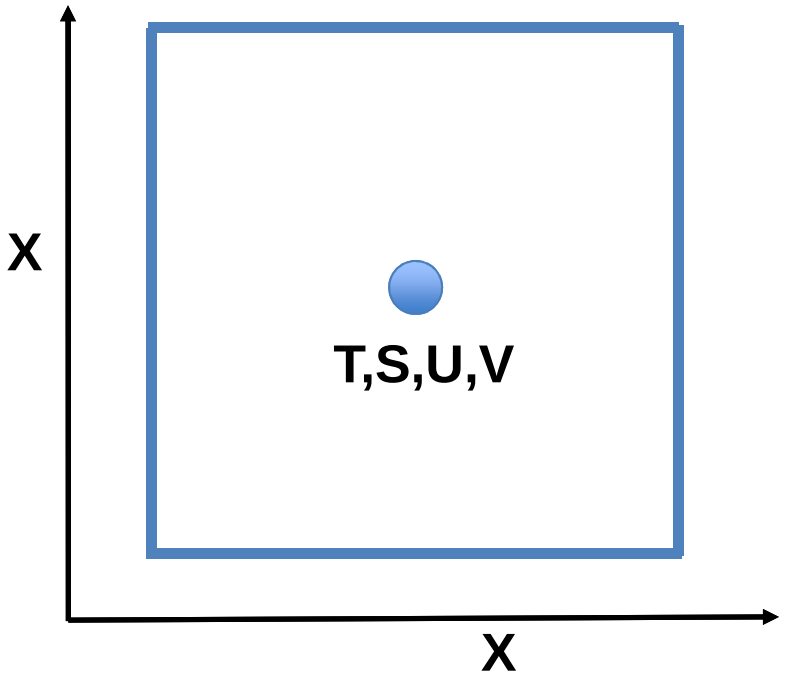
Product on native grid (PGN):

- **« mesh_hgr.nc »** (horizontal)
  - Scales factors variables: e1t,e2t, e1u, e2u,..
  - Coordinate variables: glamt, gphit, glamu,…
- **« mesh_zgr.nc »** (vertical)
  - Scales factors variables: e3t,…
  - Coordinate variables: gdept, gdepw,…
- **« mask.nc »**
  - Land-ocean mask: tmask,umask, vmask

Horizontal grid cell description

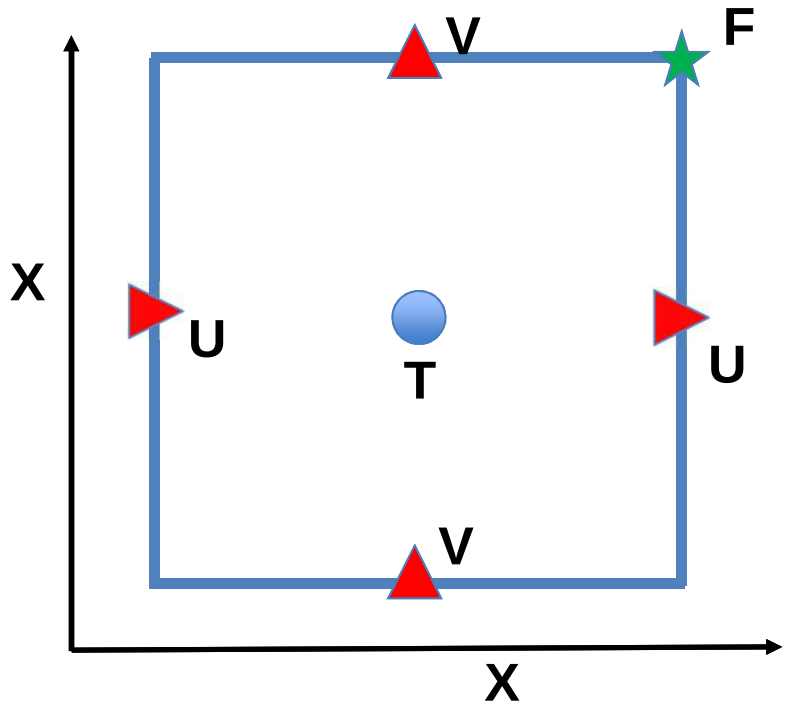
Product on standard grid (PGS):
Arakawa A-grid

The variables are all centered on the grid cell center



Product on native grid (PGN):
Arakawa C-grid

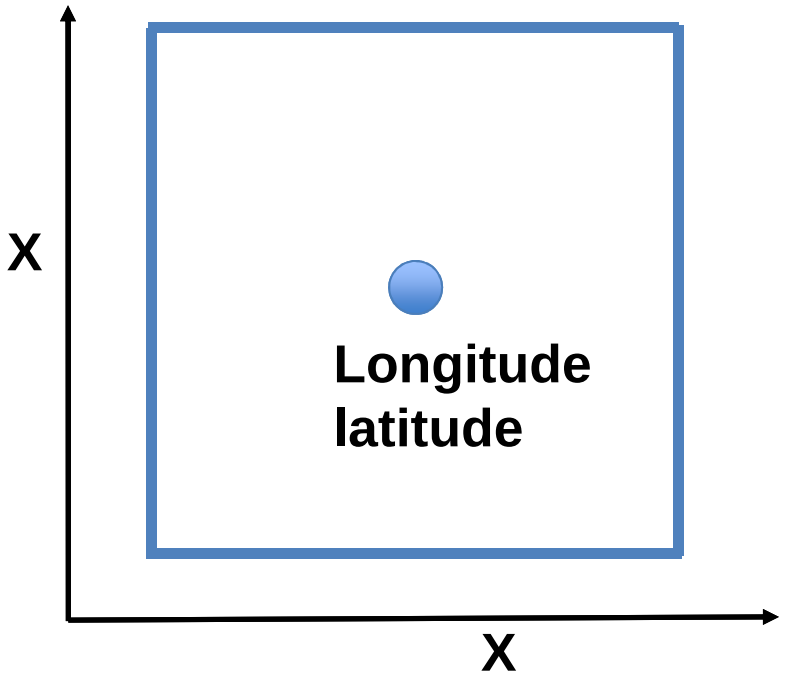
The variables are not all centered on the grid cell center
T: temperature, salinity, sea ice parameters
U: zonalvelocity
V:meridional velocity



Horizontal coordinates

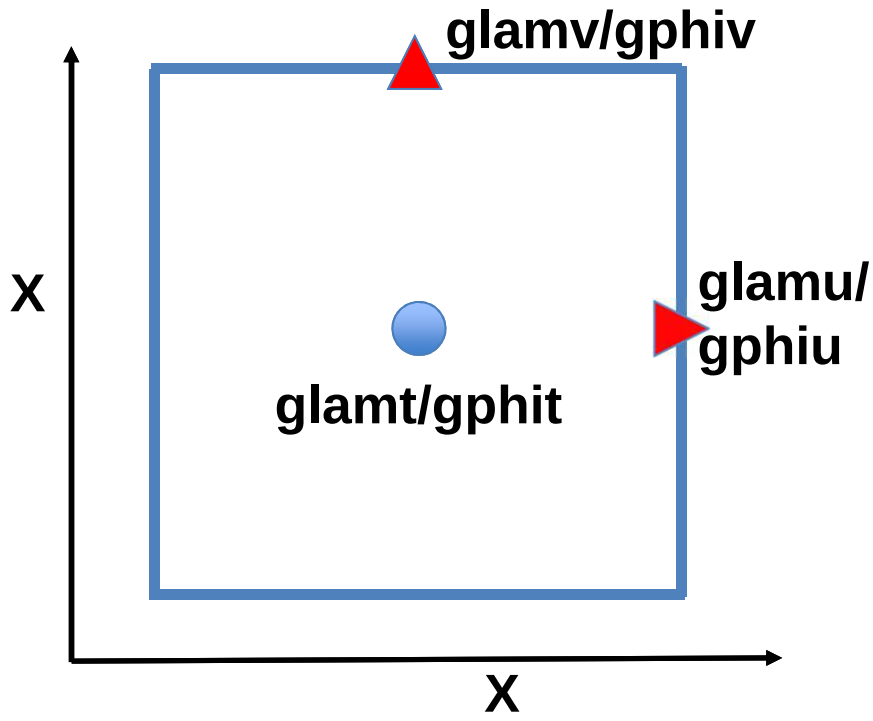
Product on standard grid

On set of longitudes/latitudes for grid cells center



Product on native grid:

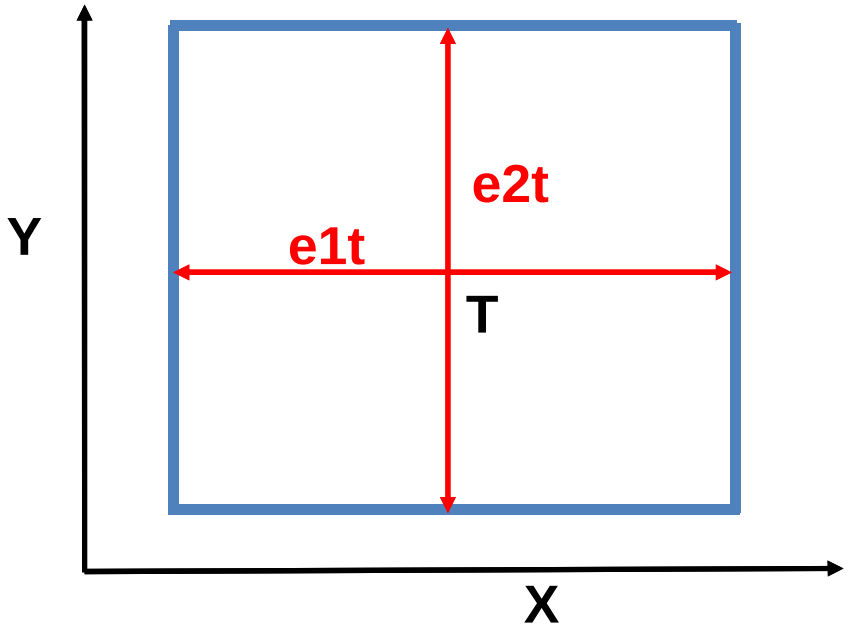
3 sets of longitudes/latitudes



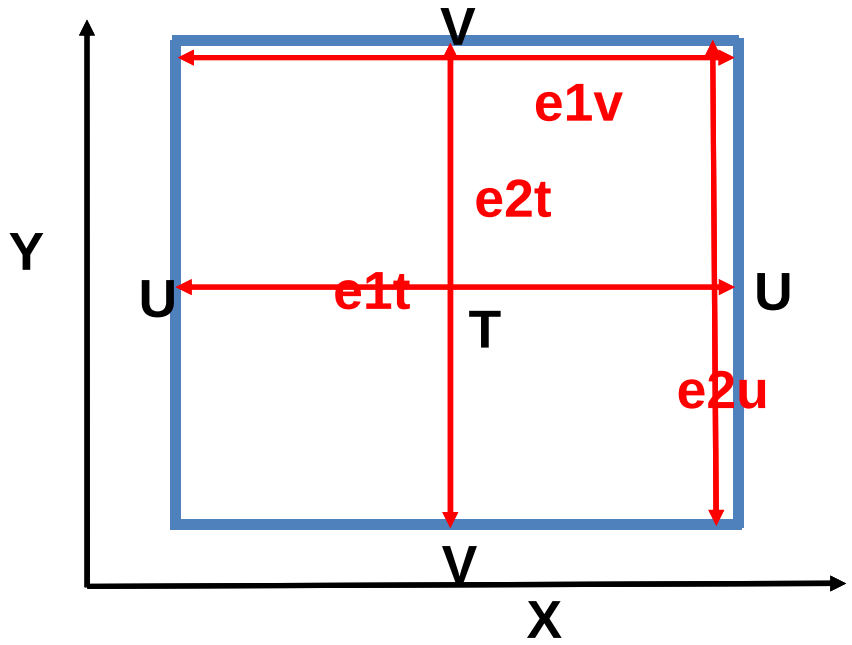
Horizontal scale factors

Scale factors: « enx »
where: n=1 for a size in the zonal direction
n=2 for a size in the meridional direction
where: x=T,U,V : the intervale is centered on 'x'

Product on standard grid (PGS)



Product on native grid (PGN):



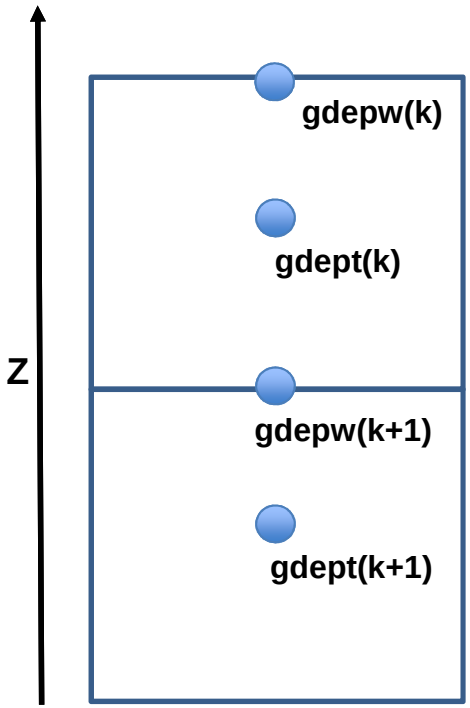
Vertical Z-grid description

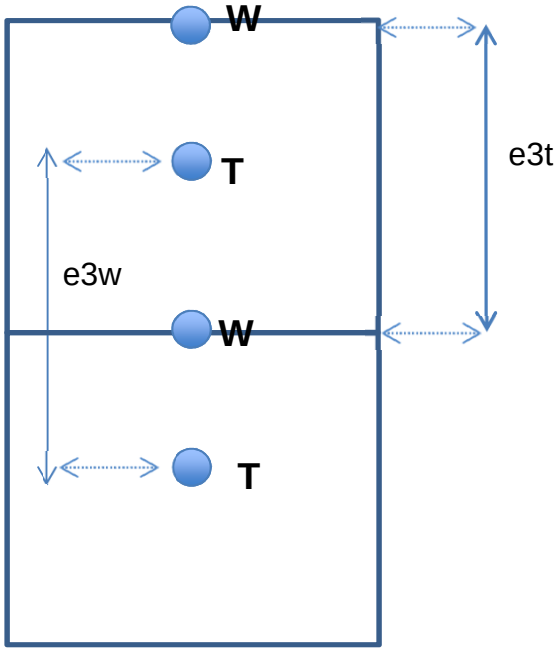
Depth

T: cells center
W: cells interfaces

Scale factors

E3: 3 for Z direction
W for centered on W
T for centered on T





Be careful:

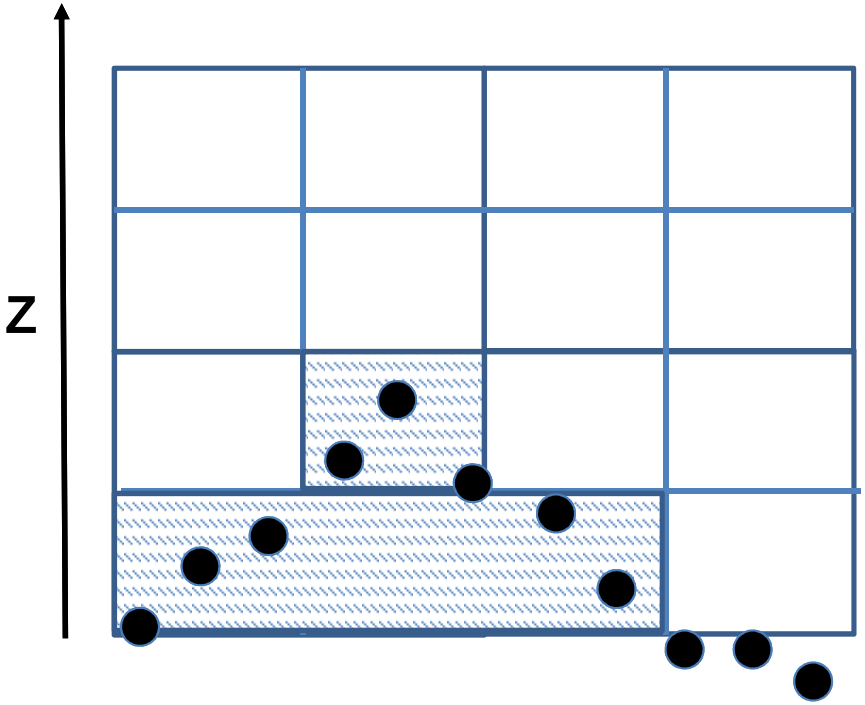
In NEMO OGCM, depth are defined with an analytical function and vertical scale factors are defined with its derived function.

That's why:
e3t(k) =/ gdepw(k+1) - gdepw(k)
AND
e3w(k) =/ gdept(k+1) - gdept(k)

Vertical Z-grid

Product on standard grid:
Uses a Z vertical grid:

All the points have the same vertical grid



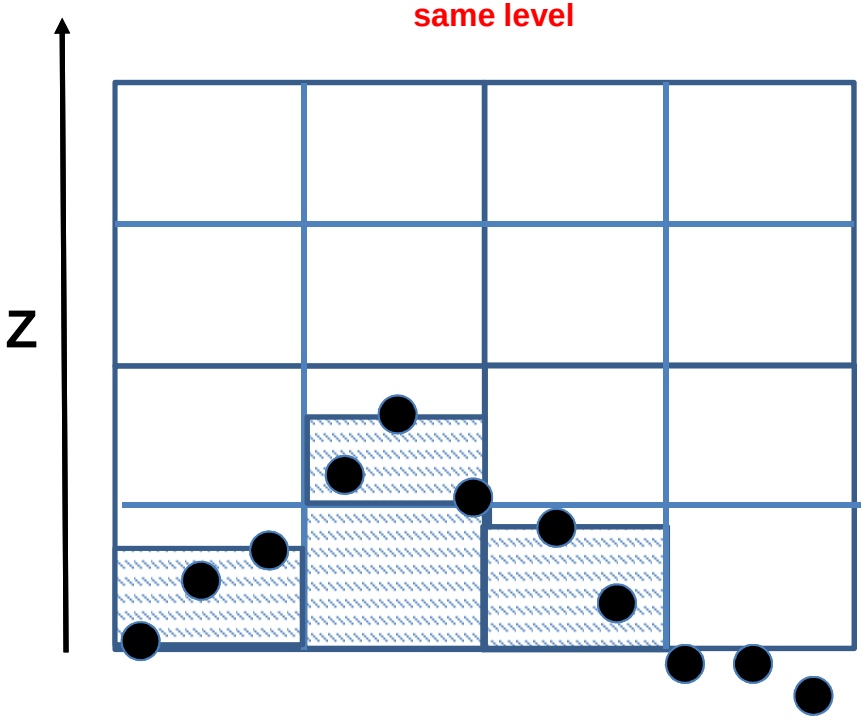
Product on native grid:
Uses a ZPS vertical grid

All the points have the same vertical grid

BUT

- the last ocean level is adapted to the bathymetrie

- So its thickness is different compare to the others at the same level



Vertical scale factors or depth reconstruction: Z vertical grid (PGS) case

- **e3t** are 3D scale factors.
- **depth** are the 1D vertical depths at T points

All the points have the same vertical grid

So the 1D vertical depth profile can be applied for all points from horizontal grid to reconstruct 3D depth.

Example:

domain size: jpi,jpj,jpk (X,Y,Z directions)

-Read depth in static file: 1D vertical scale factor profil

-declare a 3D array for vertical scale factors: depth3d(jpi,jpj,jpk)

```
-implementation:
DO ji=1,jpi ! Loop in X direction
  DO jj=1,jpj ! Loop in Y direction
     Apply the 1d profile
    depth3d(ji,jj,1:jpk)=depth(1:jpk)
  END DO
END DO
```

Vertical scale factors or depth reconstruction: ZPS vertical grid (PGN) case

- **e3t_1d** and **e3w_1d** the 1D vertical scales factors at T and W points
- **gdept_1d** and **gdepw_1d** the 1D vertical depths at T and W points
- **mbathy** : an horizontal 2D array containing the last ocean level at each point of the horizontal grid
- **e3t_ps, e3w_ps**: horizontal 2D arrays containing the scale factors at the last ocean level for each point of the horizontal grid
- **hdept, hdepw**: horizontal 2D arrays containing the depth at the last ocean level for each point of the horizontal grid

All the points don't have the same vertical grid

The 1D vertical scale factor profils and depth are applied for all points from horizontal grid to reconstruct 3D scale factors and depth **AND we apply a correction to the last ocean (identified by mbathy) with the e3t_ps, e3w_ps, hdept, hdepw.**

Example:

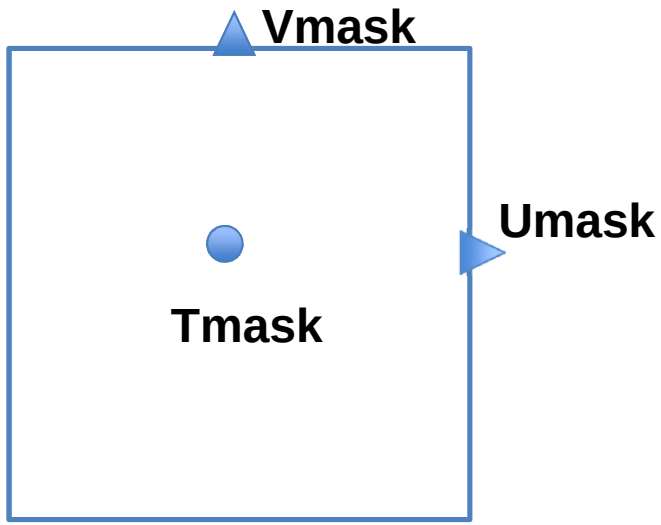
```
domain size: jpi,jpj,jpk ( X,Y,Z directions)

-Read e3t_1d in static file: 1D vertical scale factor profil
-read mbathy: the last ocean cell level
-read e3t_ps: the last ocean cell  thickness

-declare a 3D array for vertical scale factors: e3t(jpi,jpj,jpk)
```

```
-implementation:

DO ji=1,jpi ! Loop in X direction
  DO jj=1,jpj ! Loop in Y direction

    e3t(ji,jj,1:jpk)=e3t_1d(1:jpk).  Apply the 1d profile
    e3w(ji,jj,1:jpk)=ewt_1d(1:jpk) Apply the 1d profile

    ik=mbathy(ji,jj) Last ocean cell level

    IF(ik .GE. 1 )THEN where we are on ocean and not on land
      e3t(ji,jj,ik)=e3t_ps(ji,jj) apply the correction
      e3w(ji,jj,ik+1)=e3t_ps(ji,jj) apply the correction
    END IF

END DO
END DO
```

mask

For PGS (A-grid), the mask (var=???????) is the same for all variables

For PGN (C-grid), mask is not the same for all variables:

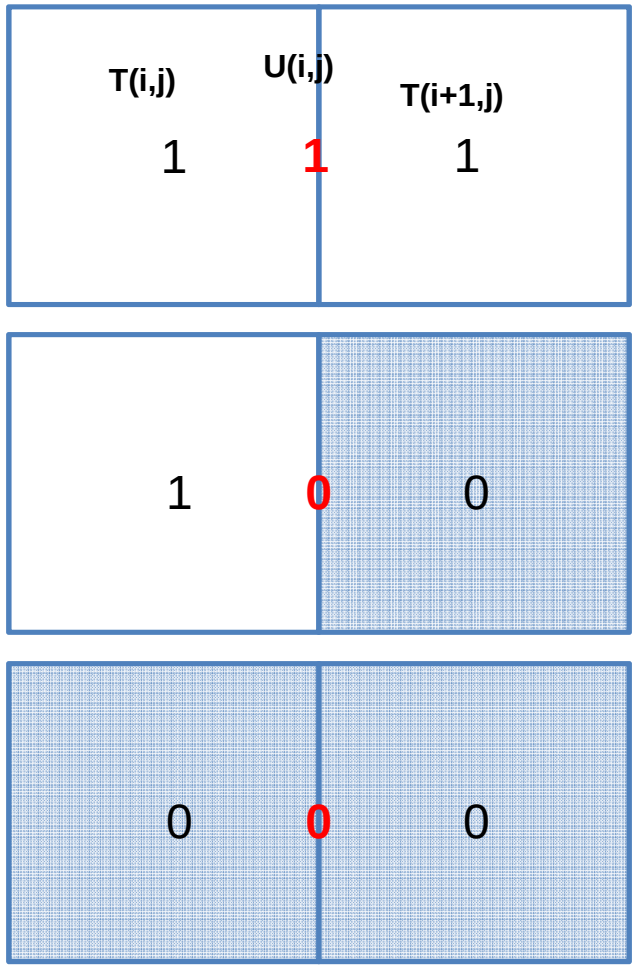


The u and v mask can be seen as a « wall » between the ocean and land.

The value is computed as :

U(i,j) = T(i,j) * T(i+1,j)

V(i,j) = T(i,j) * T(i,j+1)



legend: 0 = land; 1 = ocean