Activity 3 – Run an idealized ocean basin III

1. Impact of explicit/implicit viscosity

We will run different simulations with various numerical choices and compare the evolution of the gyre and the barotropic vorticity budget. Adapt the resolution and duration of the simulation so that it takes no more than 10-20 minutes to run

- Choose 2 (or 3) setups among of the following ones:

- Simulation 1: choose numerical options to have no implicit horizontal viscosity/diffusion and an explicit horizontal viscosity/diffusion of 1000 m^2/s
- Simulation 2: choose numerical options to have no explicit horizontal viscosity/diffusion and an advective scheme with implicit viscosity/diffusion
- Simulation 3: choose numerical options to have no horizontal implicit nor explicit viscosity/diffusion
- Simulation 4: similar to simulation 3 but with a large vertical vertical mixing coefficient (Akv_bak = 1., Akt_bak = 1.)
- Simulation 5: similar to simulation 3 but with a large bottom drag coefficient (RDRG = 3.e-2)

- For each simulation plot the different terms of the barotropic vorticity budget and the kinetic energy budget averaged over the last year of the simulation.

- Compare the vertical structure of the flow between simulations

2. Impact of topography

- Edit the file ana_grid.F and add a zonal slope at the western boundary.
- Find the largest possible barotropic and baroclinic time-steps.

```
# elif defined BASIN
      do j=JstrR,JendR
        do i=IstrR,IendR
          h(i,j)=depth * ( 1. -  exp(-10.*(xr(i,j)/xl)))
```

- Check the barotropic vorticity balance. What is the now dominant balance at the western boundary?

3. Impact of topography again

- Edit the file ana_grid.F and a chain of seamounts in the middle of your domain (or something equivalent).

- Check the barotropic vorticity and energy balances

- Plot a horizontal section of relative vorticity at the depth of the seamounts

3. Check pressure-gradient errors

- Remove the wind forcing and see what happens.

- Play with the vertical coordinate to increase the pressure-gradient errors.