mom6-panan-is updates

10-6-25

Meeting note: need help with optimisation, and I have noted in red any shortcuts I have taken that may need revisiting

1. regional om3 panan

- Helen and I made a 25km panan version by truncating 25km-OM3, worked surprisingly well, have documented steps
- Added northern OBCs from Adele's MOM6-SIS2 script using 2nd year of ACCESS-OM2 output
- Then I converted into 8km using Angus's grid and Will's WOA initial conditions
- Runs, but is expensive (~90kSU/yr with limited diagnostics and no cavities) (not my priority to optimise)
- Have problems producing restart files (depends on length of run) and running from restart (segfault)

Meeting note: MOM6-SIS2 10th degree cost is ~30kSU/yr, so this is relatively quite expensive

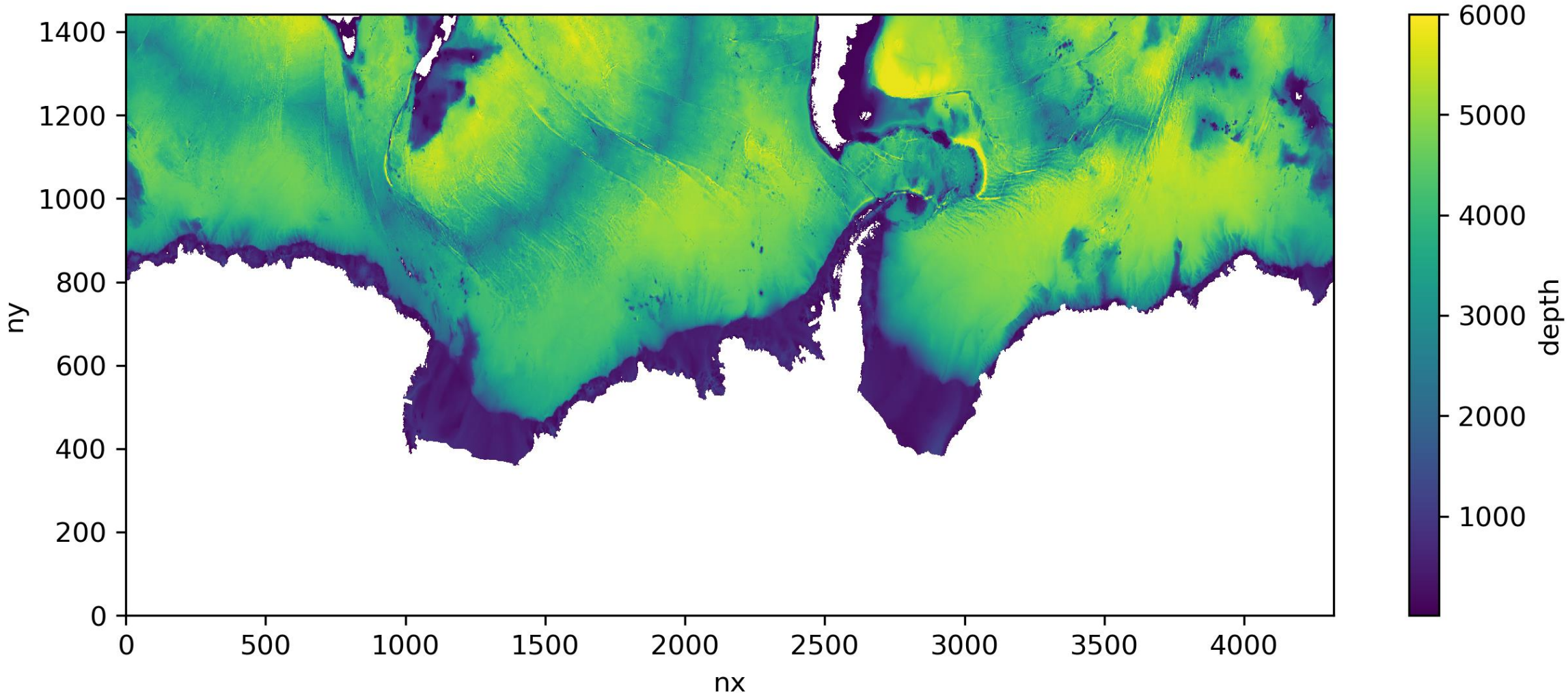
Meeting note: Helen gets same/similar? segfault in regional case

2. topography and ice thickness files

- Ezhil made regridding method to convert Charrassin to model grid
- I stitched it to Angus' GEBCO topo elsewhere, doesn't look too discontinuous
- For new topo, doing a lot manually (existing pipeline makes assumptions that don't work for antarctica, e.g. land if depth<=0)
- Created new mask (sea ice/atmos and ocean masks both needed)
  - Sea ice mask: uses regridded Charrassin ice thickness (also for no ice shelf ocean mask)
  - Ocean mask is from Charrassin grounding line (ocean thickness variable) and then extended by 10 neighbour iterations so that the grounding line is natural in MOM6 but not computing for a ridiculous number of vanishingly thin ocean cells (shortcut)
- Made my own method to get rid of lakes/unconnected cells (thanks to Jemma's help) since Fortran version not working, enforced max and min ocean depth etc (shortcut)

Meeting note: Perhaps this GL thing is overkill and adds unneeded vanished ocean cells to expensive model. Maybe run the model for one day to work out where MOM6 grounding line is (from floating condition and real ocean densities) and then create mask for that. This is all motivated by MOM6 and Charrassin having different grounding lines (from floating - MOM6 uses real density, Charrassin a ref, and maybe difference ice densities.
Meeting note: My lake method not too different to existing one (numbers every cell and takes min of connected cells, I just check if ocean is neighbour)

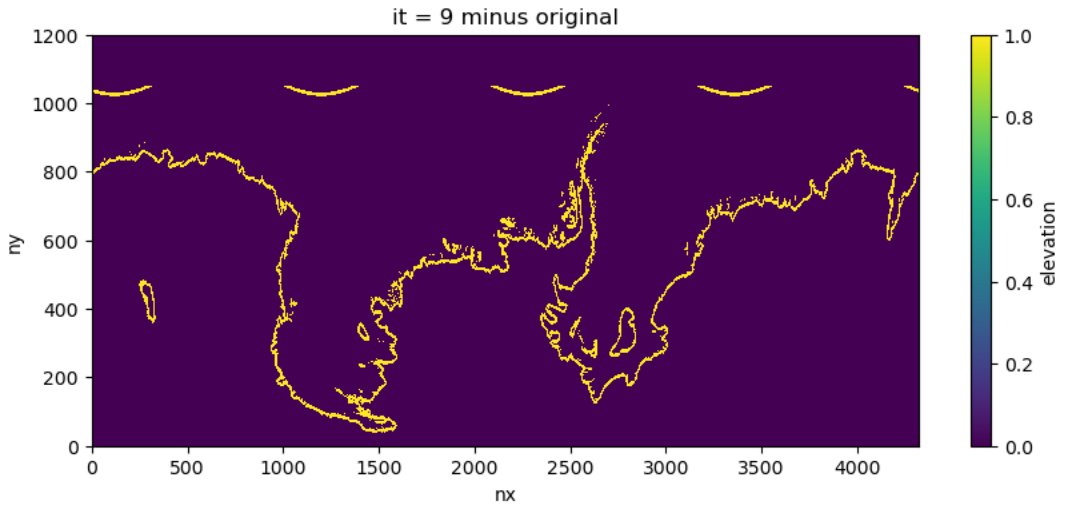
New no-cavity topography (runs for at least 90 days)



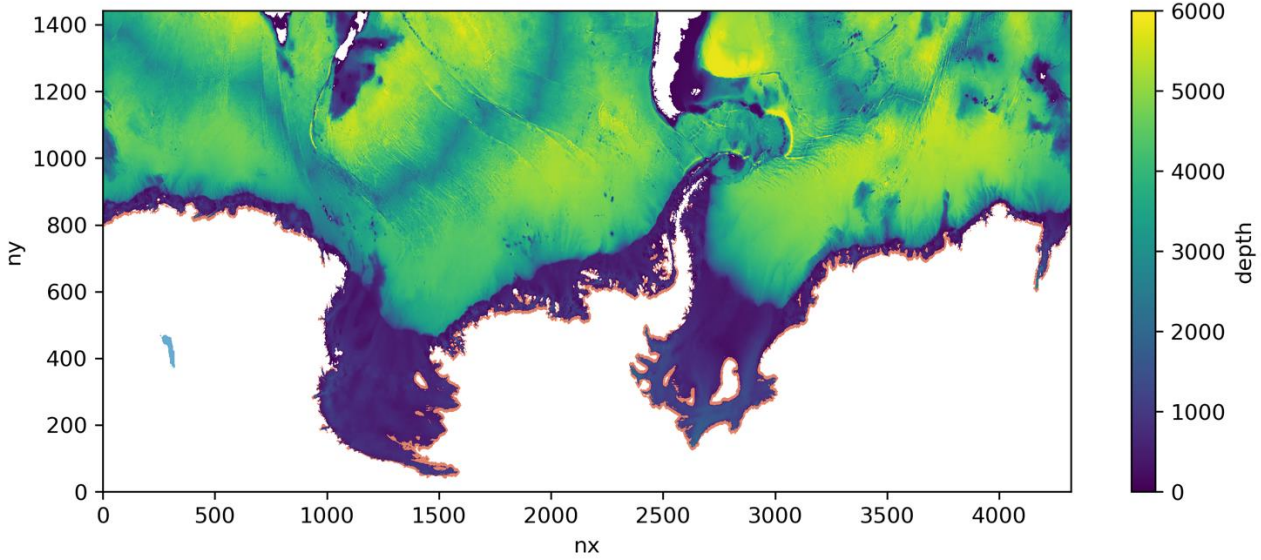
Extended ocean mask for ice shelf cavities

Iteration processing

(thicken the yellow grounding line)



topo



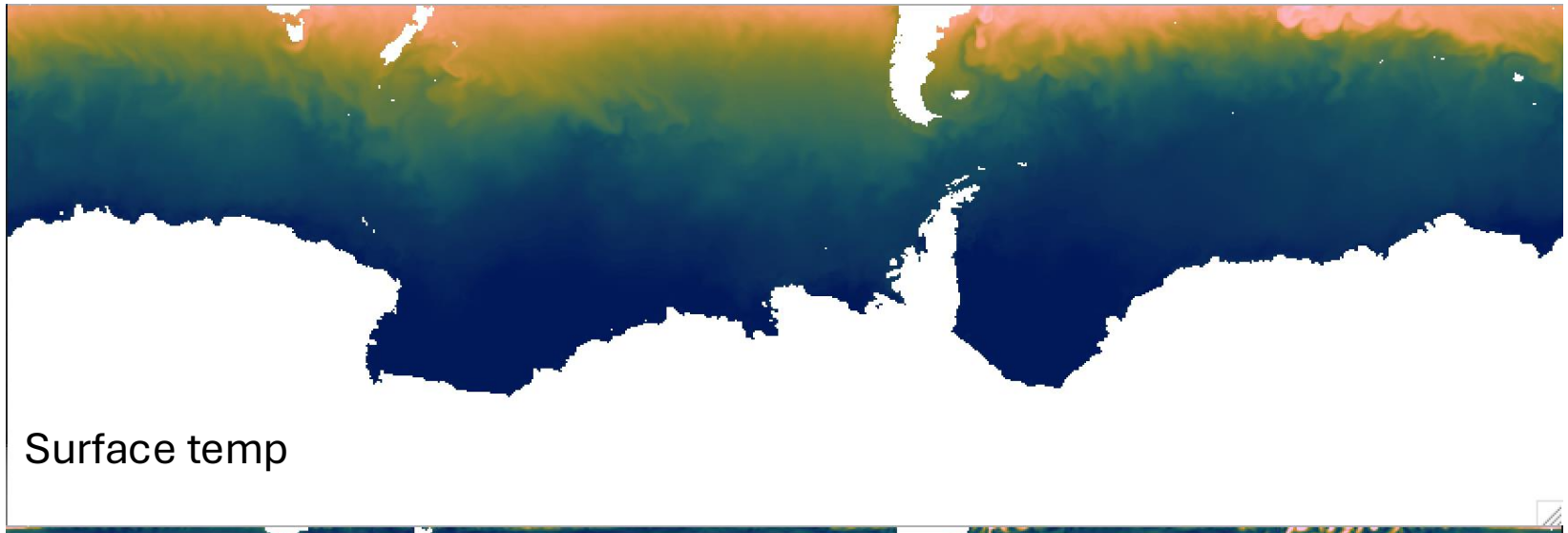
Meeting note: iteration moves land back in all directions, not directly southwards
Method of iteration by 10 steps depends on resolution
Everything documented but only in ipynb notebooks.

3. initial conditions and salt restoring

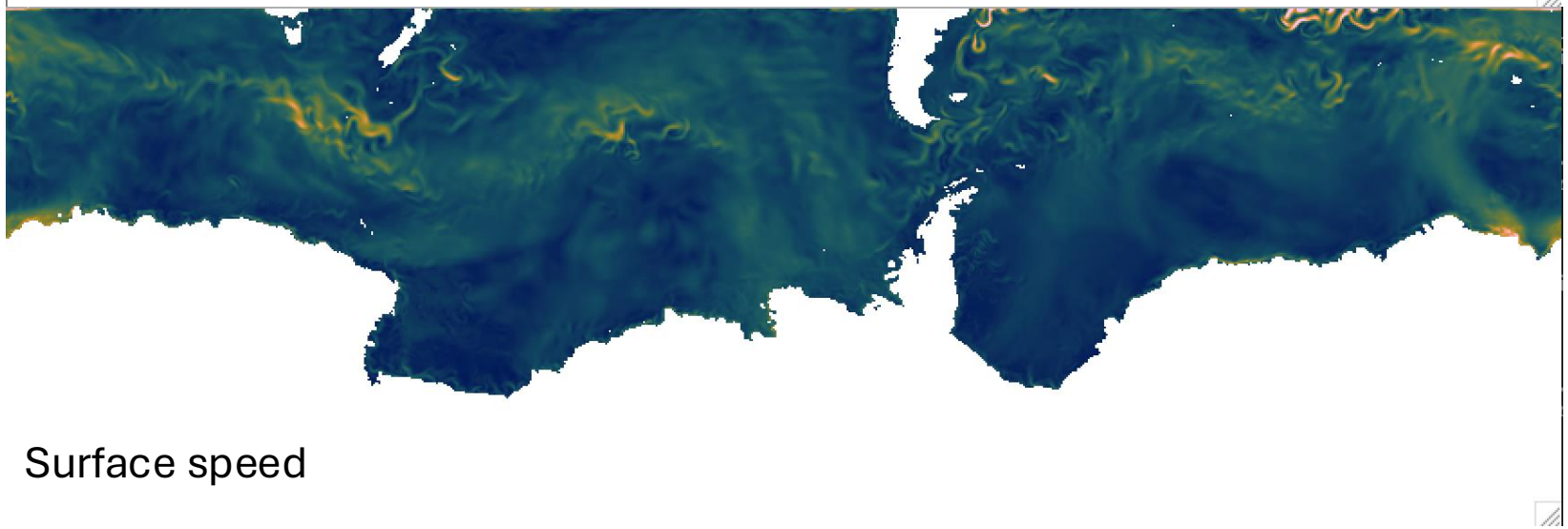
- Using Wilton's file, uses WOA13 not WOA23, taken from MOM6-SIS2-panan-01 (shortcut)
- I copied the same regridding process for salt restoring (since OM3 method very slow and had problems)
- Regridding uses xr.regrid(nearest neighbour method) not xesmf bilinear – is that an issue? (shortcut)
- Need to change model eqn of state to match conservative temp…

Meeting note: regridding with nearest neighbour probably fine since WOA uncertain anyway

8km Charrassin bathy panan (NO ice shelf) after 90 days



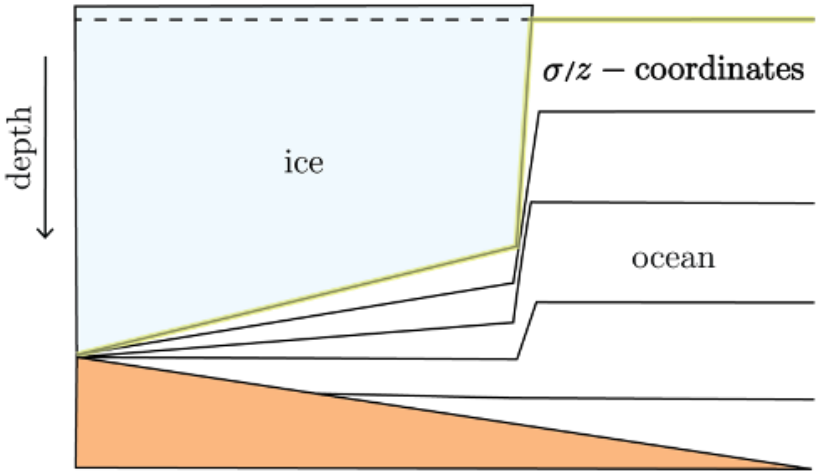
Surface temp



Surface speed

4. vertical coordinates and model melt crash

- MOM6 ice shelf (even idealised) crashes in zstar mode with melt
- Attributed to difficulty distributing meltwater heat and freshwater fluxes over vanished layers (surface layers near ice are vanished in zstar), leading to unphysically cold vanished layers
- Angus and I looking at this, talked to Bob and Alistair too
- Back up: hoping quasi-ice shelf following coordinates (SIGMA_SHELF_ZSTAR) does not crash (idealised model suggests ok), but not ideal to have discontinuity at ice shelf front (shortcut)



Meeting note: expect shortest path forward is open cavities and use SIGMA_SHELF_ZSTAR, since works for idealised
Also addressing bug probably easiest done in idealised model. Try ZSTAR without melt?

5. other....

- Choose sea ice CICE categories? Meeting note: 2m max category
- nuopc and atmos/sea ice/ocean masks? salt restoring mask? Ensure atmos does not talk to ocean below ice shelves!
- access-om3 symmetric executable with merged ice shelf fixes
- choose high-res MOM6 parameters
- fix restart problems so I can run longer

Meeting note: Think carefully about nuopc mesh file mask. Salt restoring mask seems possible in MOM6. Maybe turning off salt restoring easier.

Next steps:

- 10 year run without ice shelves, model verification
- Open cavities up....

Skip meeting in 2 weeks, next meet in 5 weeks (16 July)