Eastern Bering Sea Dynamical Downscaling from CMIP6: Results and Caveats

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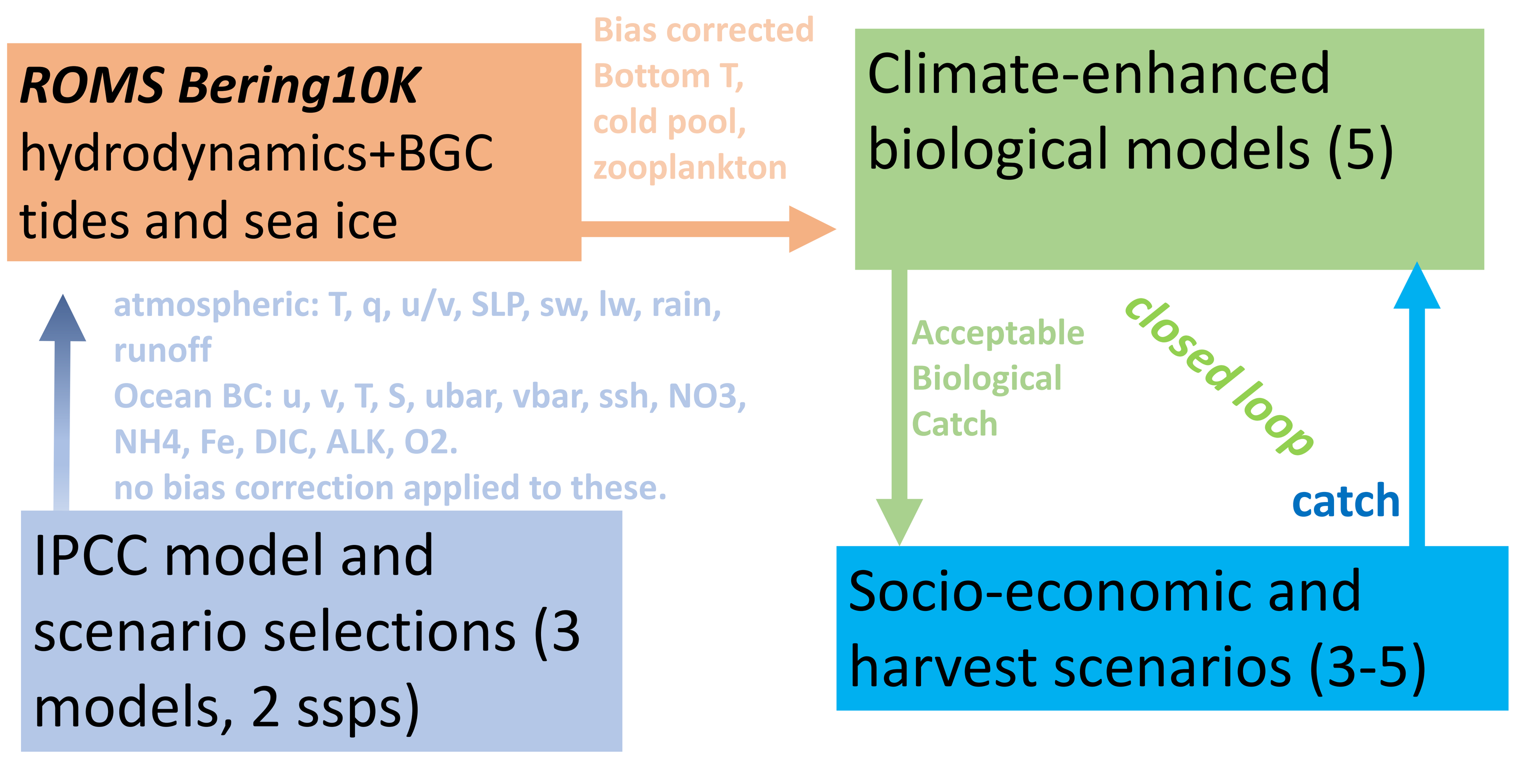
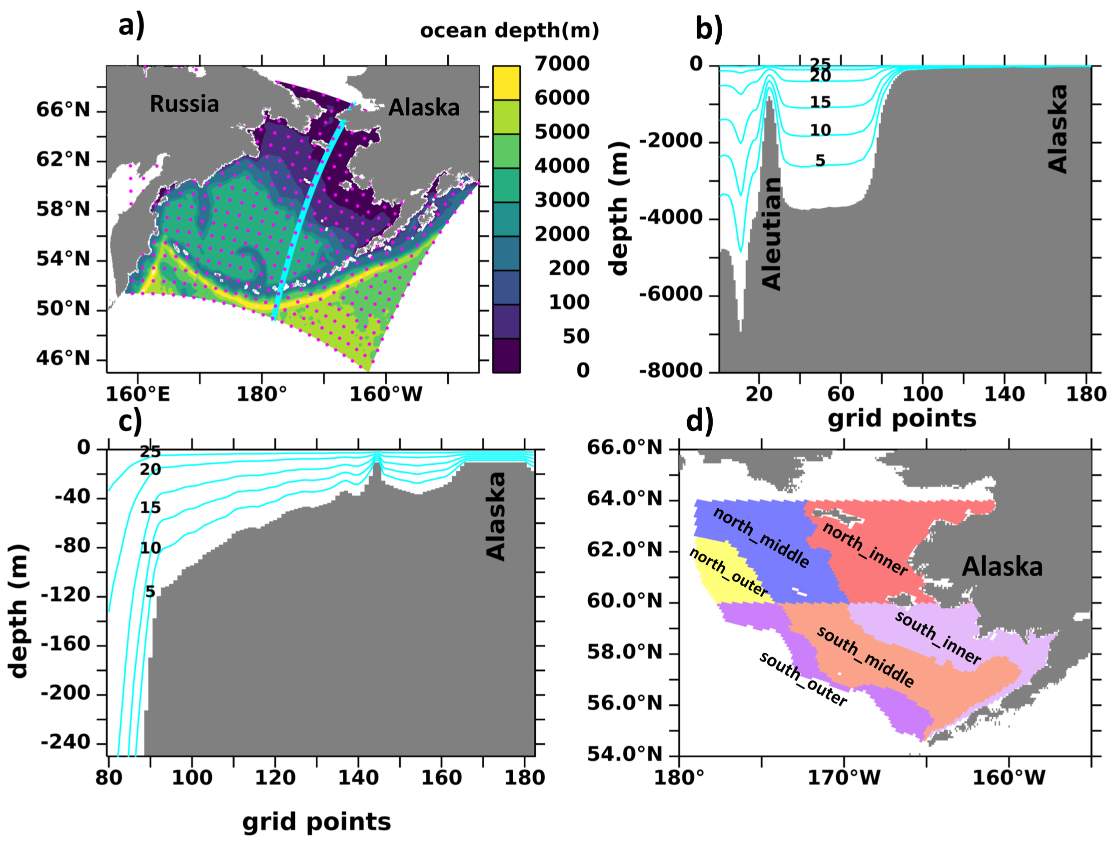
ACLIM - Alaska CLimate Integrated Modeling



ROMS configuration

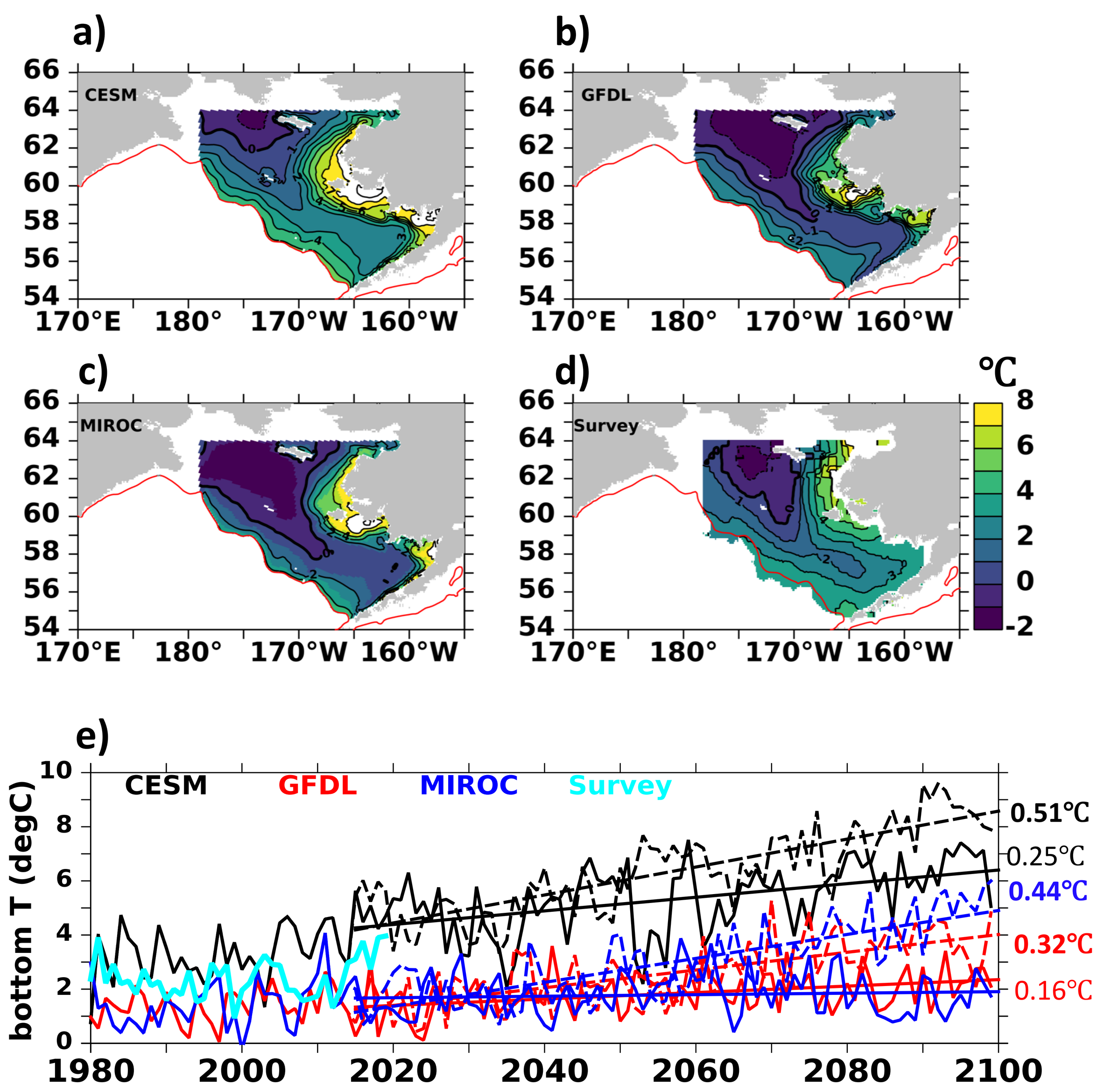


- **(a)** ROMS Bering Sea domain (1/100th grid points shown)
- **(b)** ROMS terrain-following vertical layers across the full model domain.
- **C)** as in **b)** but zoom on to the eastern shelf.
- **(d)** eastern shelf divided into 6 sub-regions by the 50-m, 100-m, and 200-m isobath and 60ºN in our analysis. Each has distinct biophysical characteristics.

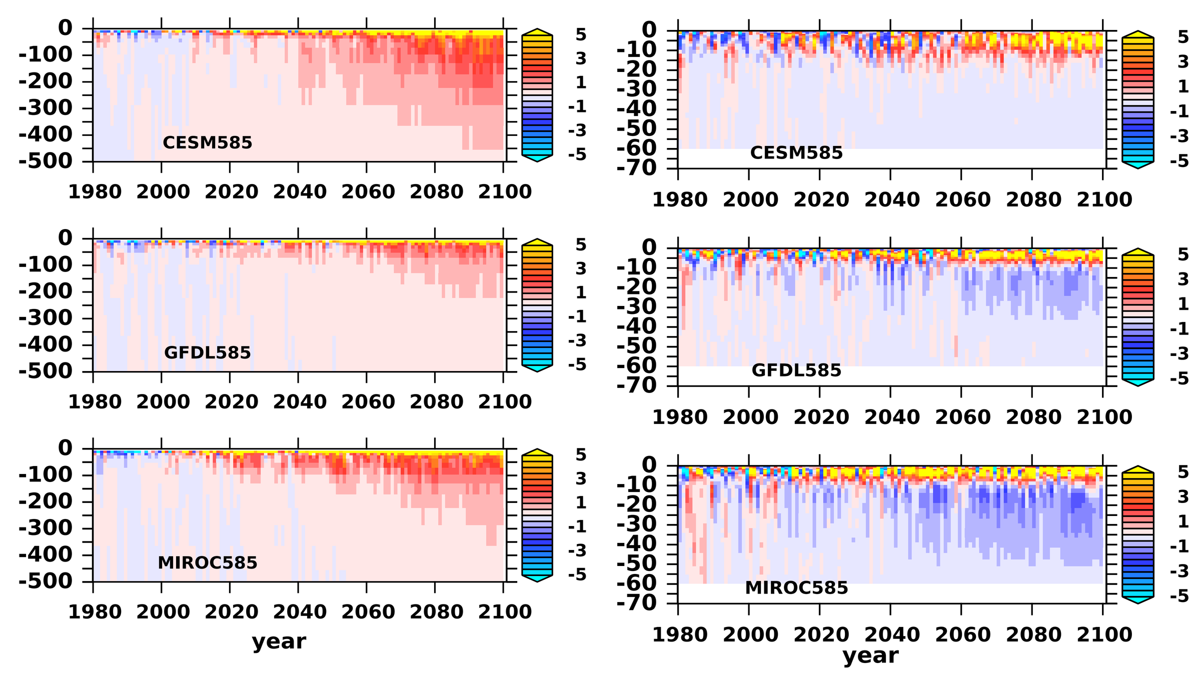
Take-home messages from dynamical downscaling

1 Eastern Bering Sea Shelf summer bottom temperature warms significantly.

(a-d)1980-2014 mean state, indicating simulations capture the observed pattern. e) Warming amplitudes in degC/decade. Dash (solid) lines are forced by SSP585 (SSP126).

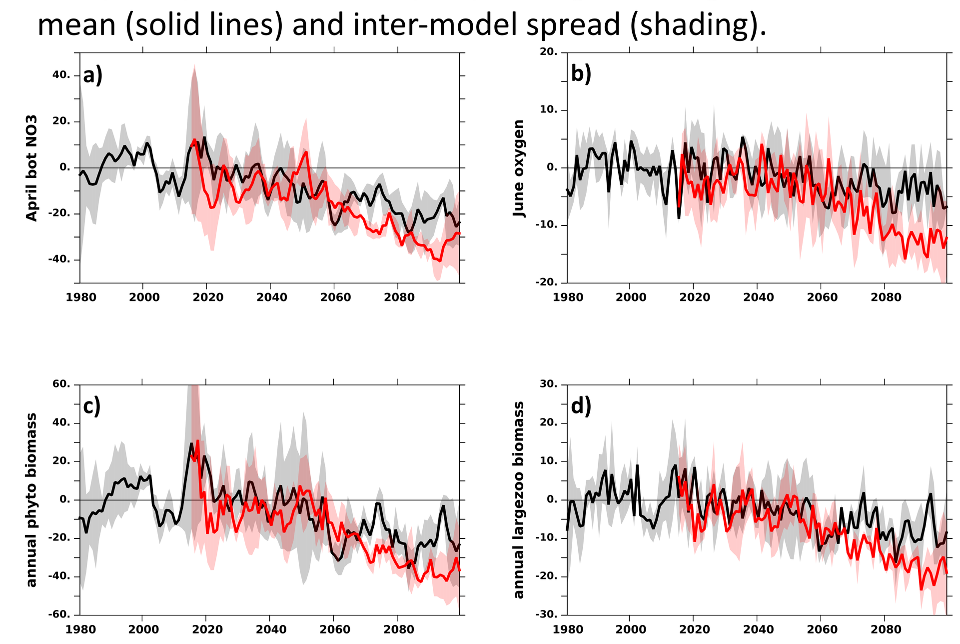


2 Summer stratification (measured by buoyancy frequency N^2) increases in the basin (left column) but decreases on the shelf (right column), the latter is caused by diminishing sea ice.



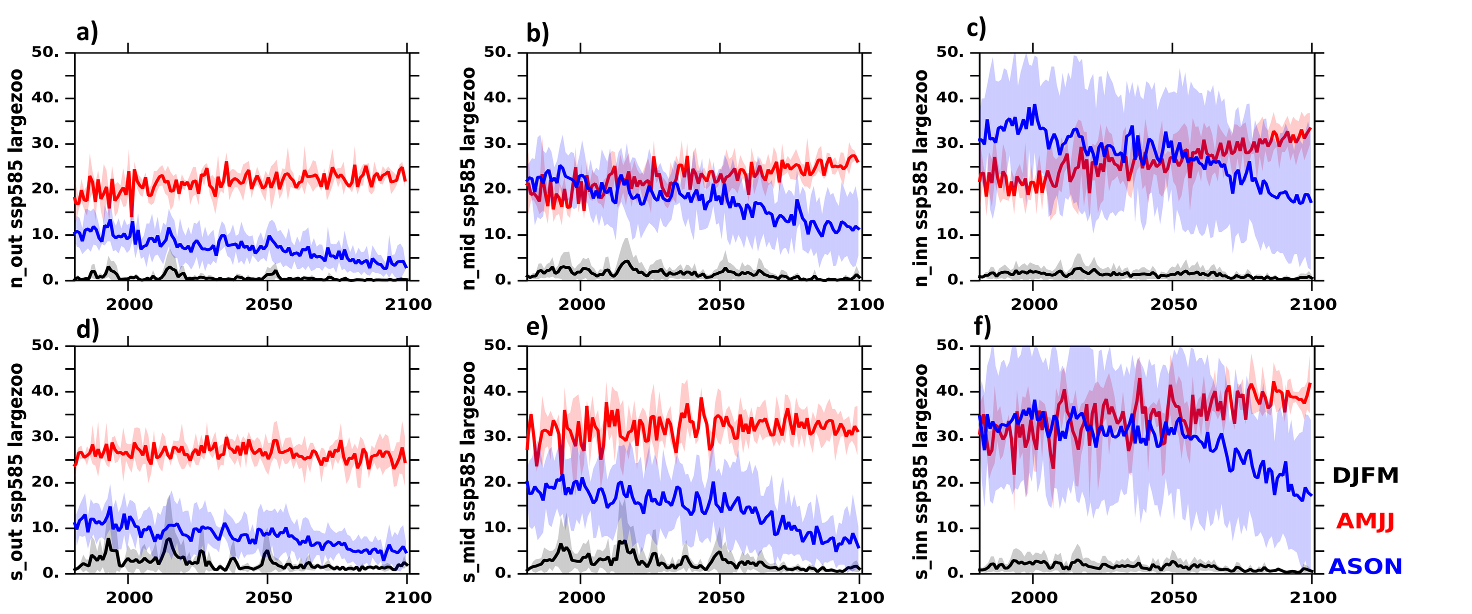
3 Biological stressors include weakened nutrient supply (a), lower oxygen (b), and decreasing biomass (c-d).

Percentage decrease relative to the 1980-2014 mean states. Red (black) is from SSP585(126) forcing, showing multi-model mean (solid lines) and inter-model spread (shading).



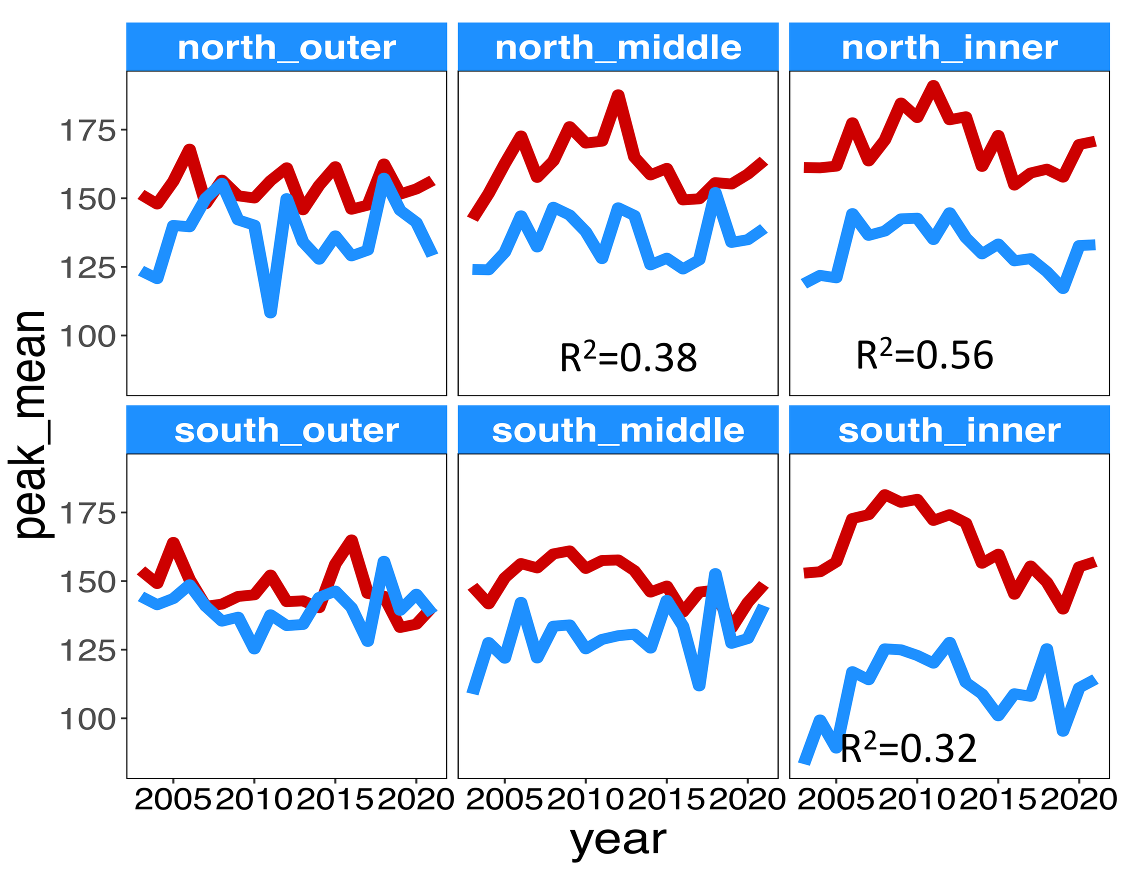
4 Phenology shifts earlier.

Spring biomass (red line) increases while fall biomass (blue line) decreases. Solid line is multi-model mean and shading represents inter-model spread. Panels represent the different shelf sub-regions shown in 'ROMS configuration' above. This is forced by SSP585.

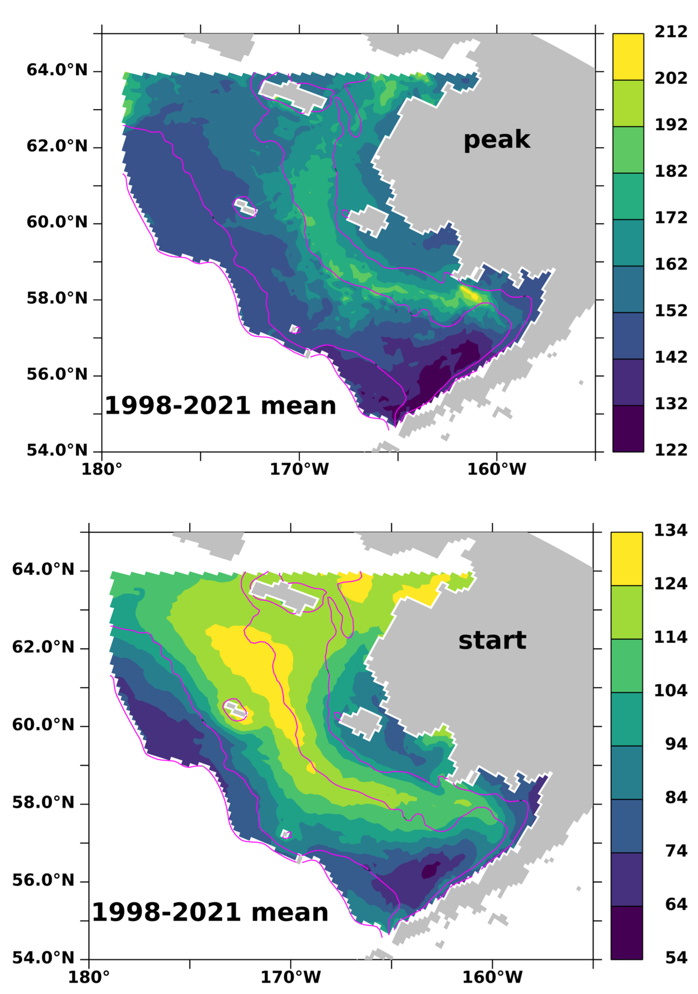


Ongoing analysis – bloom timing dynamics

Reanalysis driven hindcast simulation captures the interannual variability of chlorophyll peak timing but is biased too late, particularly on the inner domain.

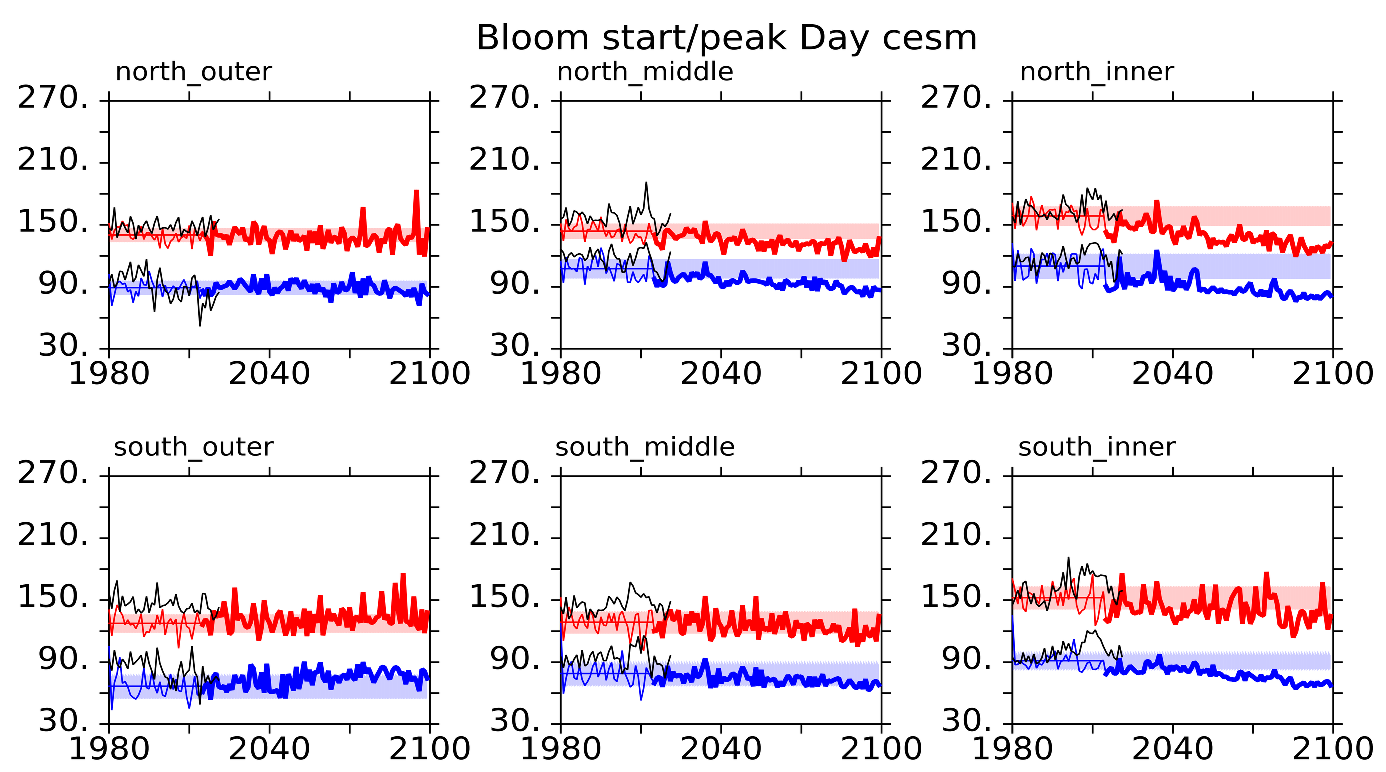


Mean spatial pattern suggests relatively late bloom start and peak between 30-m and 70-m (contours are 30-m, 50-m, 100-m, and 200-m isobath). Why?



First look at projected bloom peak (red lines) and start (blue lines) day.

- shifts earlier in the northern shelf, particularly in the inner and middle domain;
- "time of emergence" does not occur until mid to late century;
- shift is less robust in the southern shelf;
- no significant change in duration (start and peak shift at roughly the same rate).



To access the complete publication of this study, scan the QR code.

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