"DFO/COMDA developments in preparation for GOAPP: Who's doing what?"

D. Wright, Y. Lu, Z. Wang, J. Su, M. Dunphy   BIO/OCS

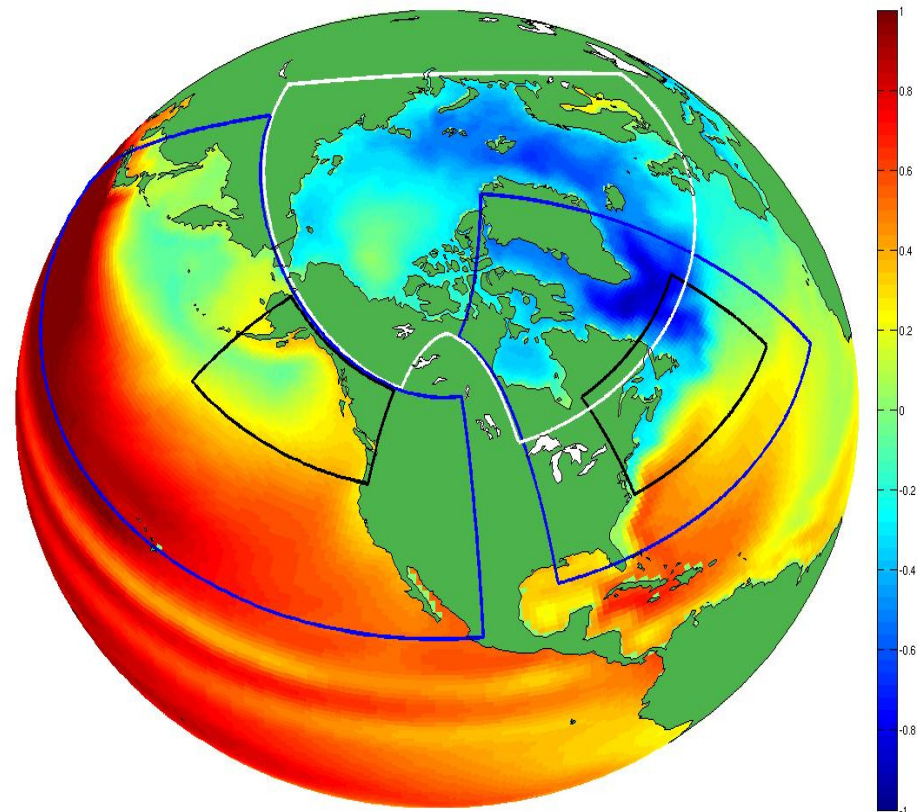Also including a special cameo appearance by Dave Brickman

Common Domains
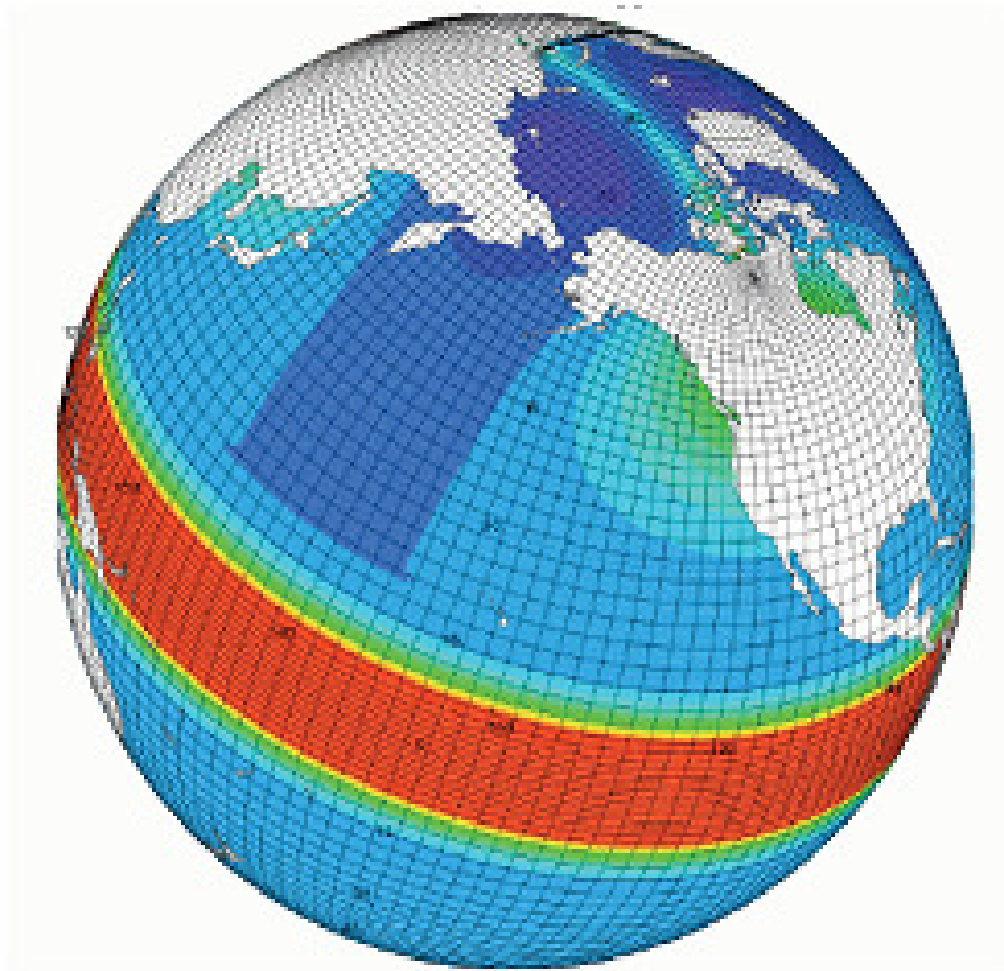## All grids will be consistent with the Mercator ORCA025 model

- Global (1º, 1/4º)
- Arctic (1º, 1/4º)

- North Atlantic (1/4º)
- NW Atlantic (1/4º)
- EAST (1/12º)

- North Pacific (1º, 1/4º)
- NE Pacific (1/12º)

46 vertical levels

For coarse resolution (1º) simulations we'll use the UK modification. Why?

1º Global and Arctic configurations

Required for reanalysis work, climate studies
and ensemble prediction studies

Surface forcing
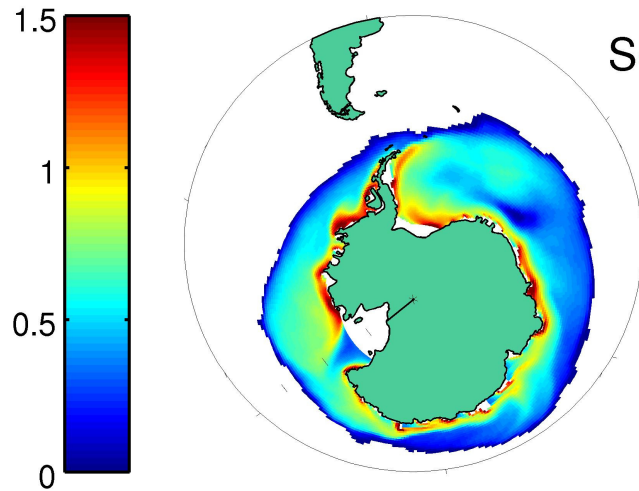
- Climatological forcing so far
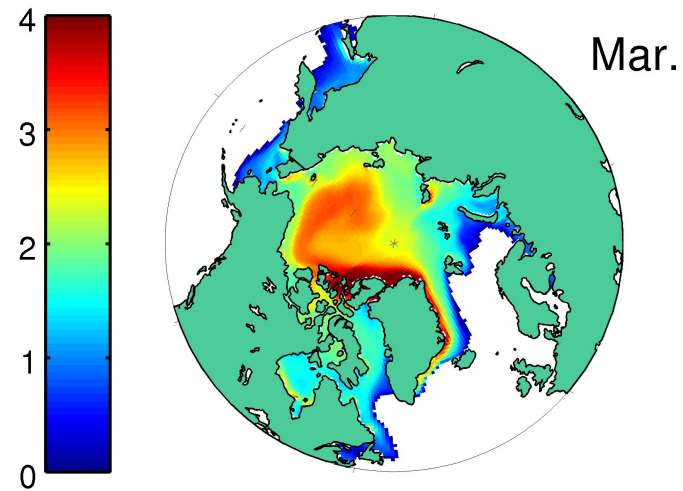- Will use same fields as European groups for comparability

Sea ice

- LIM (LLN ice model) routinely available in NEMO/OPA
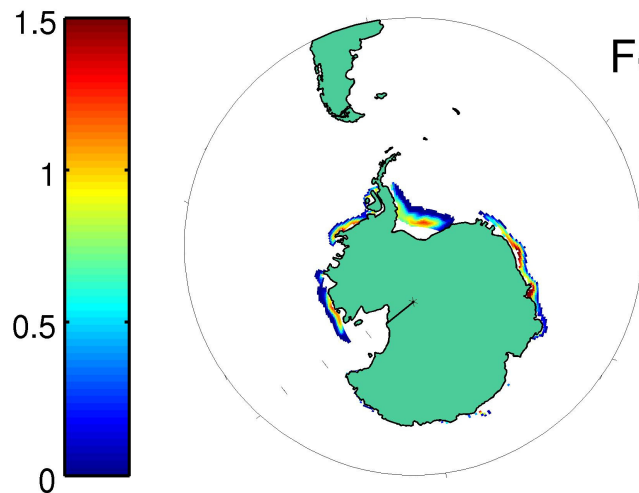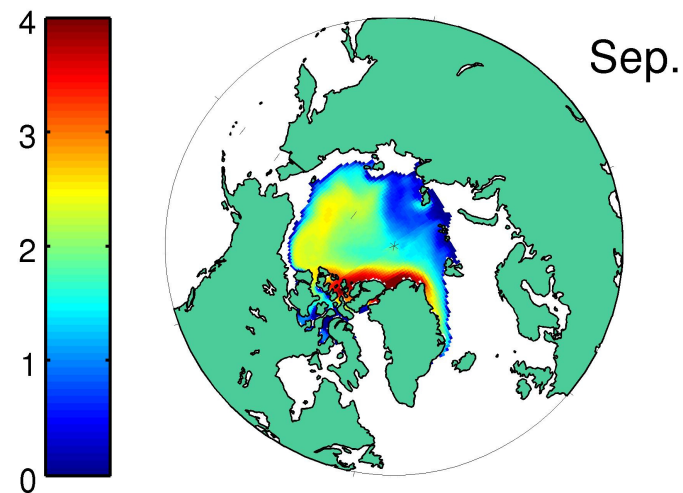- Draft manuscript on sea ice sensitivities

Global Model (Ice Thickness)

Global Model (Ice Concentration)
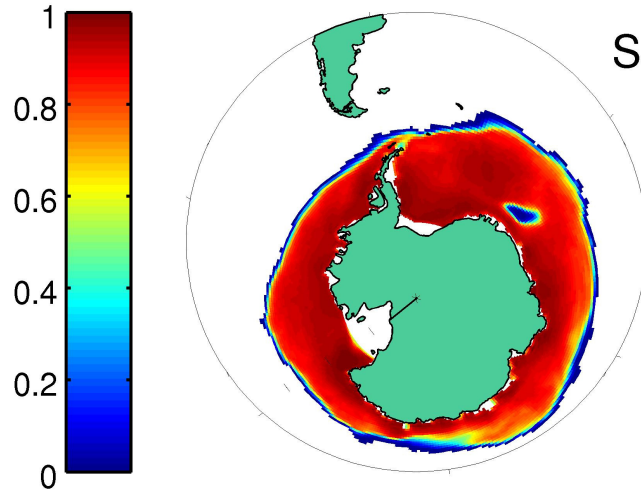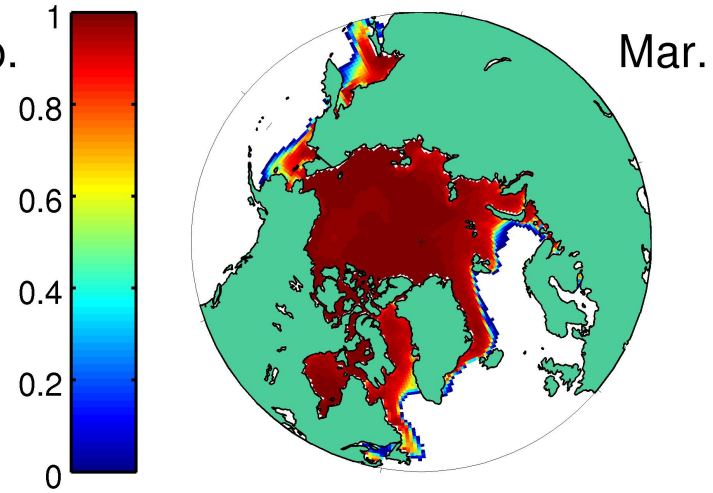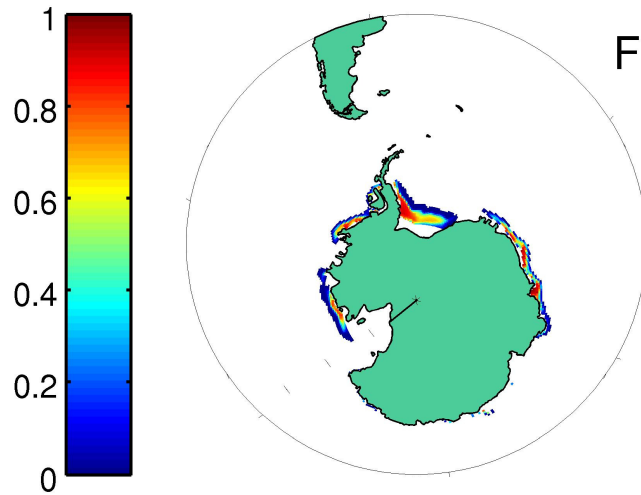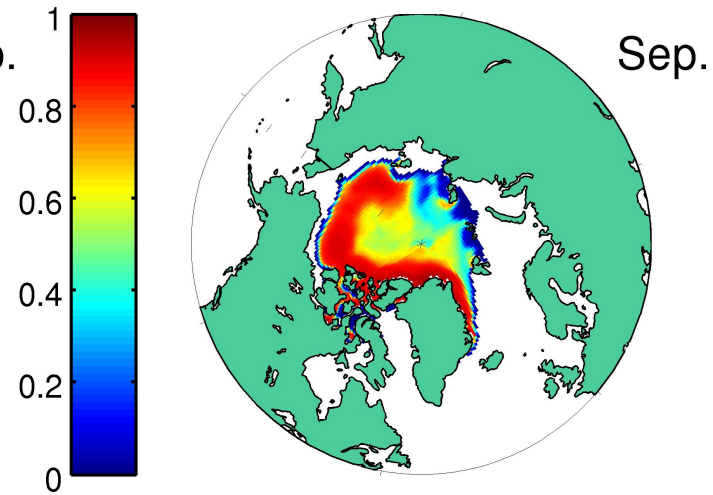
Spectral Nudging
in a 1 degree global model

- Preliminary results are encouraging

Effects on Sea Level
(and Major Currents)
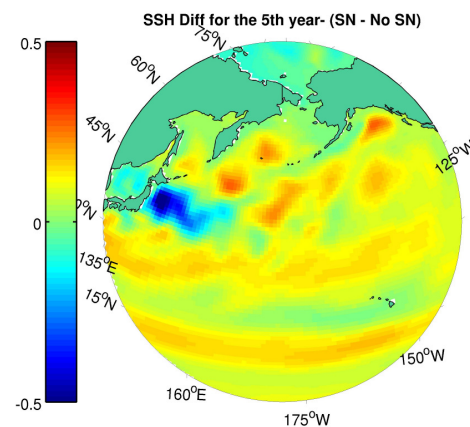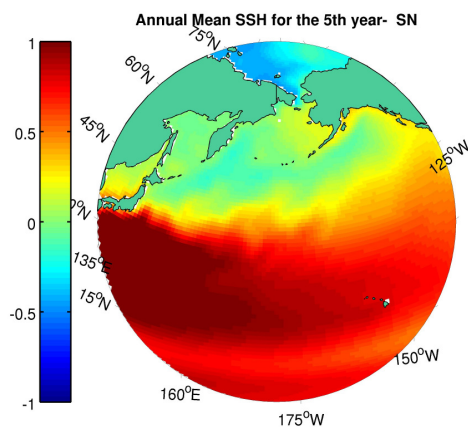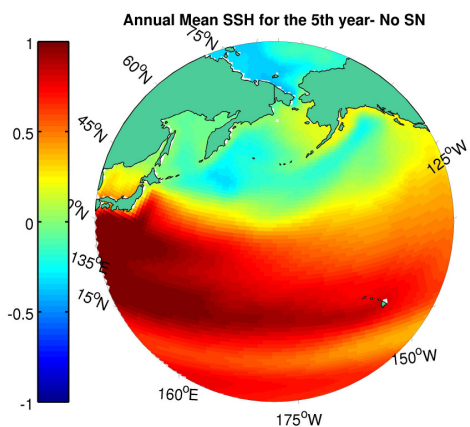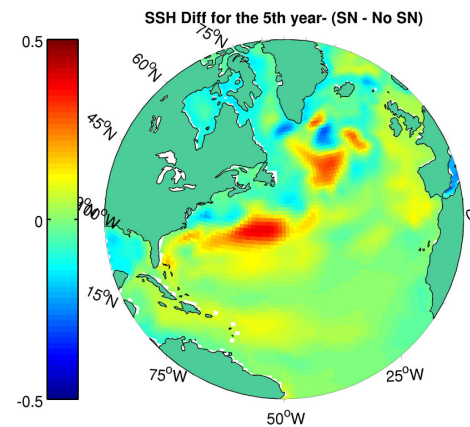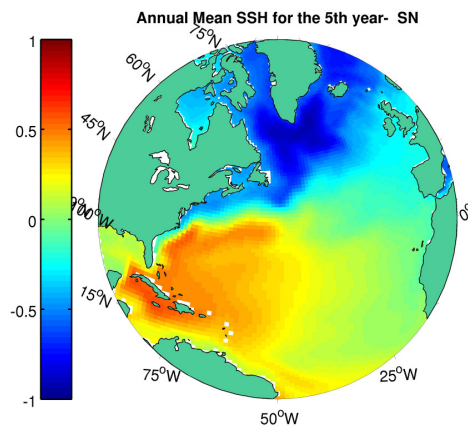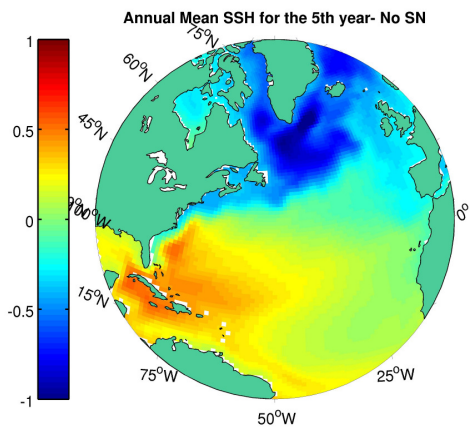
No Nudging   Spectral Nudging   Difference

Hints about Effects on SST

(Both runs use climatological forcing and surface restoring but second run has spectral nudging at all levels)
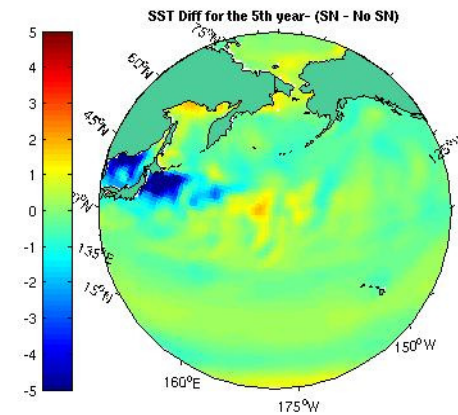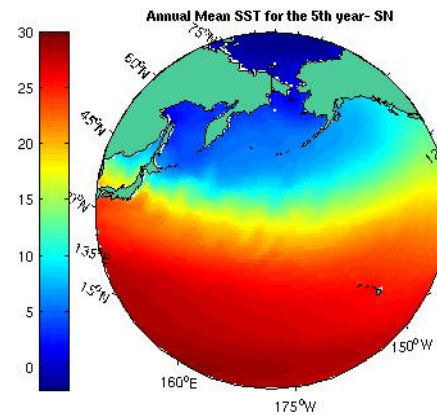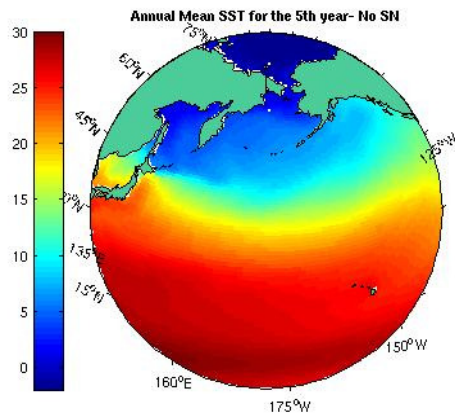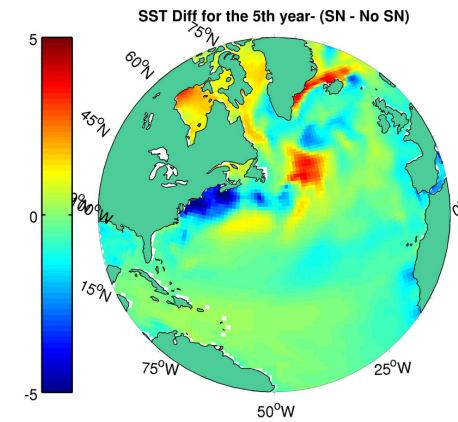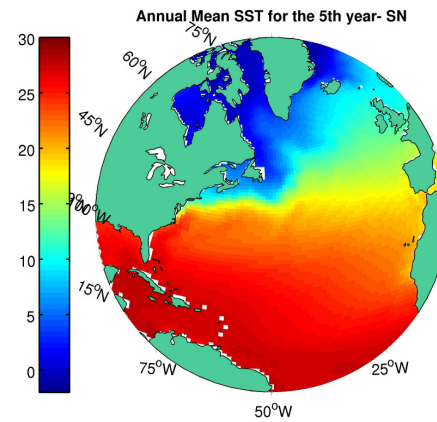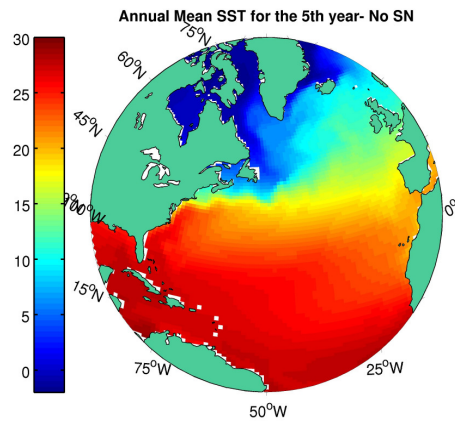
No Nudging   Spectral Nudging   Difference

North Atlantic configuration

- Needed for DA & eddy-admitting reanalysis work (also for CONCEPTS)
- ¼ degree formulation implemented and tested
- Results comparable to earlier POP model results

  ➤ **Spectral Nudging**
  - Tested in ¼ deg NA model
  - Results comparable to POP experience

  ➤ **AGRIF**
  - $1/12^\circ$ EAST in $1/4^\circ$ NWA common area tested
  - Will hopefully be implemented in C-NOOFS system soon

  ➤ **Optimized parameters for ¼ degree resolution**
  - Dependence on mixing parameters crudely mapped out
  - Need longer runs to improve reliability
  - Put on hold for now
    - -- reproducibility problems resolved, but require lots of CPU time
    - -- could accept Mercator/DRAKKAR choices

Open Boundary Conditions

- Radiation on BT velocity, "sponge layer" on T,S working
- Prospects for improvements from Mercator and Drakkar

Depth Averaged Velocity at 220 days

10 cm/s

~0.3 Sv

~3.5 Sv

~3.8 Sv
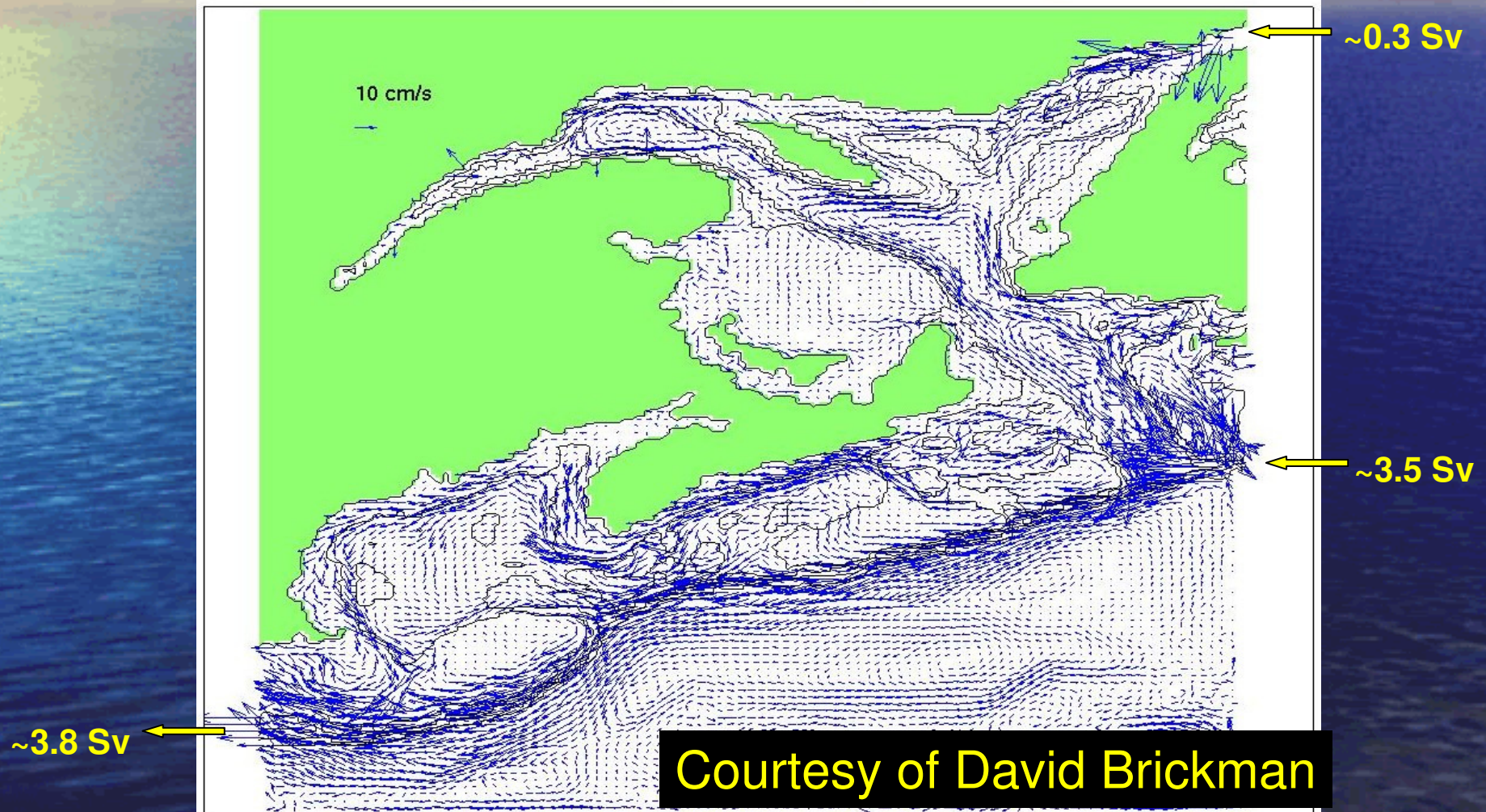
Courtesy of David Brickman

Shelf Model: Tides

M$_2$ co-amplitude

M$_2$ co-phase
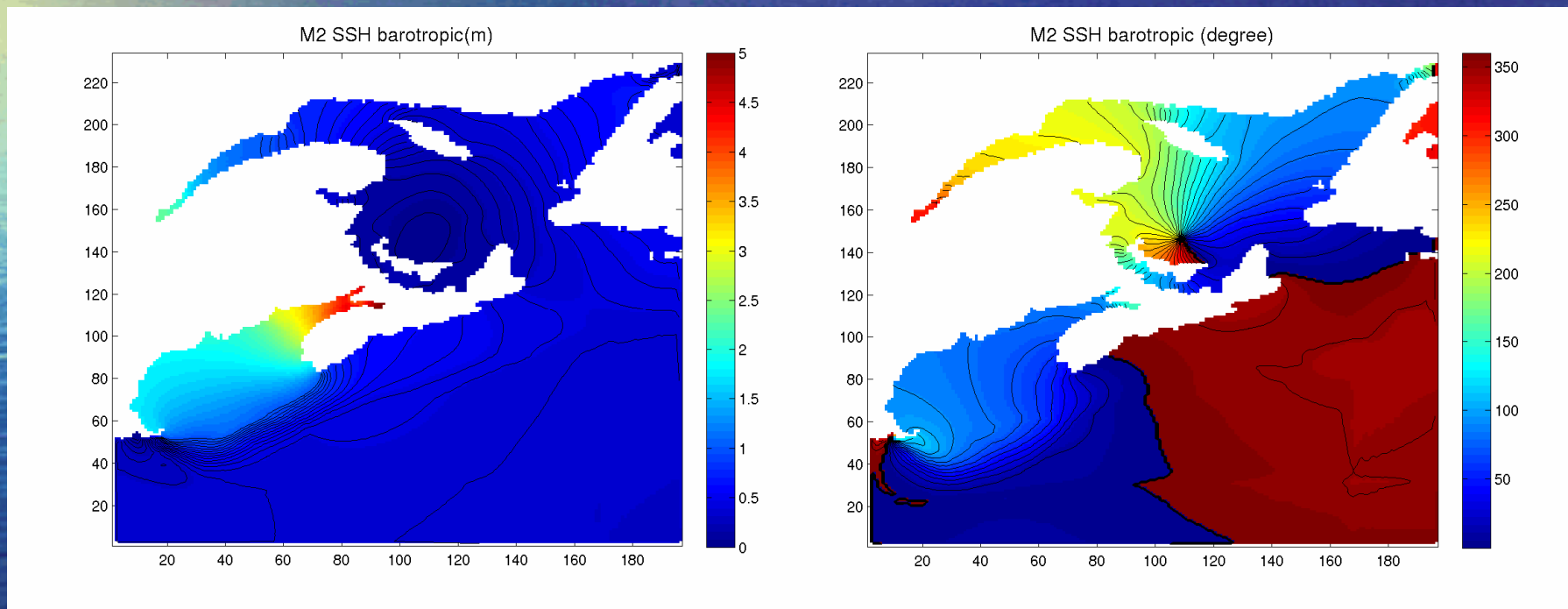
Shelf Model: Impacts of Tides on SST

Without tides

With tides
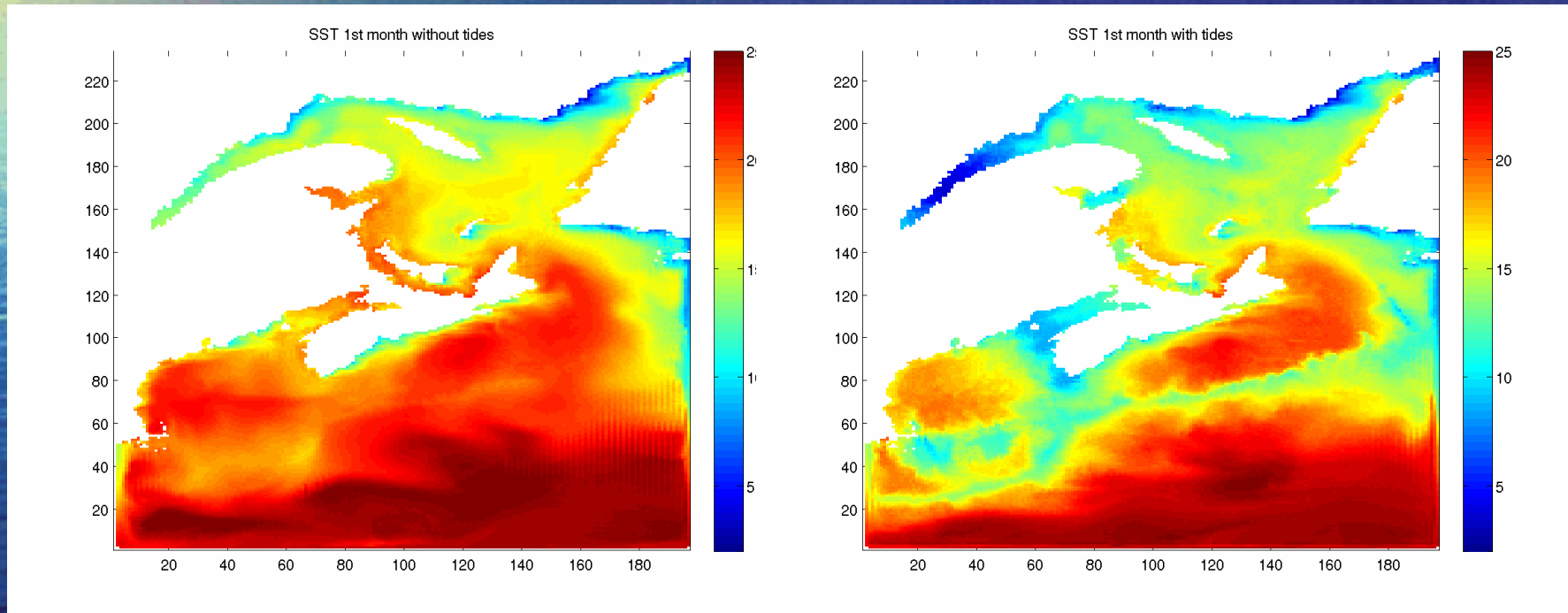
Next Priorities

➢ **1º Global Parameterizations**

- Examining the possibility of reducing the need for spectral nudging by using a combination of Neptune (BT) and Gent-McWilliams (BC)

➢ **1º Global Simulations**

- Examine effects of different bias reduction approaches (prognostic, nudging, neptune, Gent-McWilliams)

➢ **1º Arctic Simulations (CONCEPTS project)**

- Focus on sea ice in ocean only models
- Mixing sensitivity studies
- Comparison with 1/4-deg Mercator results

Next Priorities (cont'd)

- **1/4º NA and NP reanalysis**
  - Compare and coordinate with Mercator/DRAKKAR
  - Validation against observations
  - Experiment with old and new DA methods
  - Effects of embedded 1/12º EAST domain

- **Coupling with GEM** (depends on EC)

The End

Thanks for listening

Dan

- Model set-up (keys, parameters, forcing)
- Diagnoses and correction of model problems
- Model tests
- Model-data intercomparison metrics
- Examining of model predictive skill
- Spectral nudging, Neptune, GM
- Help implement new DA methodologies
- Interpretation of model results

Youyu

- Model set-up
- Forcing fields (surface and OBC fields)
- Identification of problems and solutions
- OBCs and tides
- Metrics for model-data intercomparisons
- Sea-ice model intercomparison
- Collaborate on interpretation of model results

Zeliang

- Code master
- Model setups (grids, forcing, etc)
- Model runs
- Sensitivity tests
- Model-data intercomparisons
- Interpretation of model results

Jie (Arctic)

- Model setup and runs
- Model-data intercomparisons
- Sensitivity experiments
- Open boundary conditions and tides

Mike

- Lead on reproducibility issues
- Set up of benchmark tests
- Agrif work for embedded EAST domain
- Optimization of ¼ deg model parameters
- General assistance with coding