

3-D Modelling: The Validation Problem

Sino-NZ Environmental Modelling Workshop
Wuxi, China

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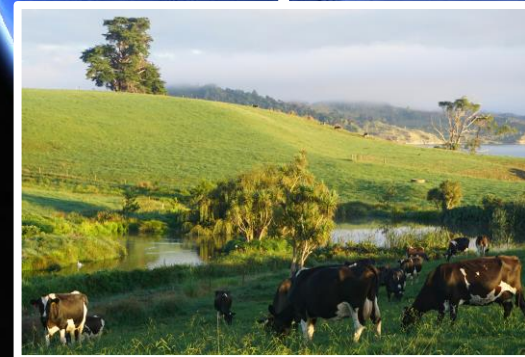
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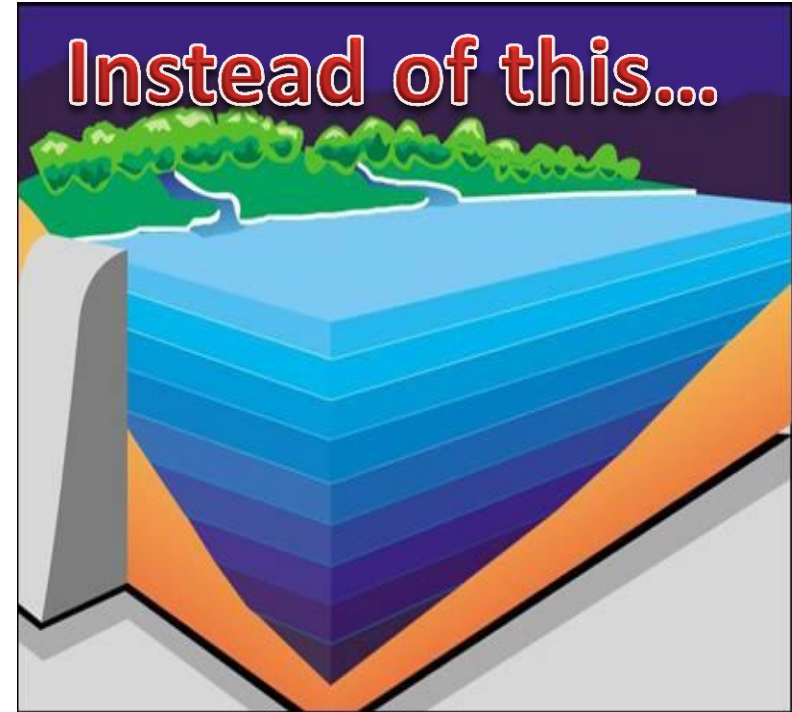
- 2014-present** **Research Fellow**
University of Waikato
- 2009-2014** **Environmental Consultant**
Halifax, Canada
- 2007-2009** **PostDoc**
Dalhousie University, Canada
- 2007** **PhD Biol. Oceanography**
Dalhousie University, Canada



1-D models can not capture 3-D dynamics



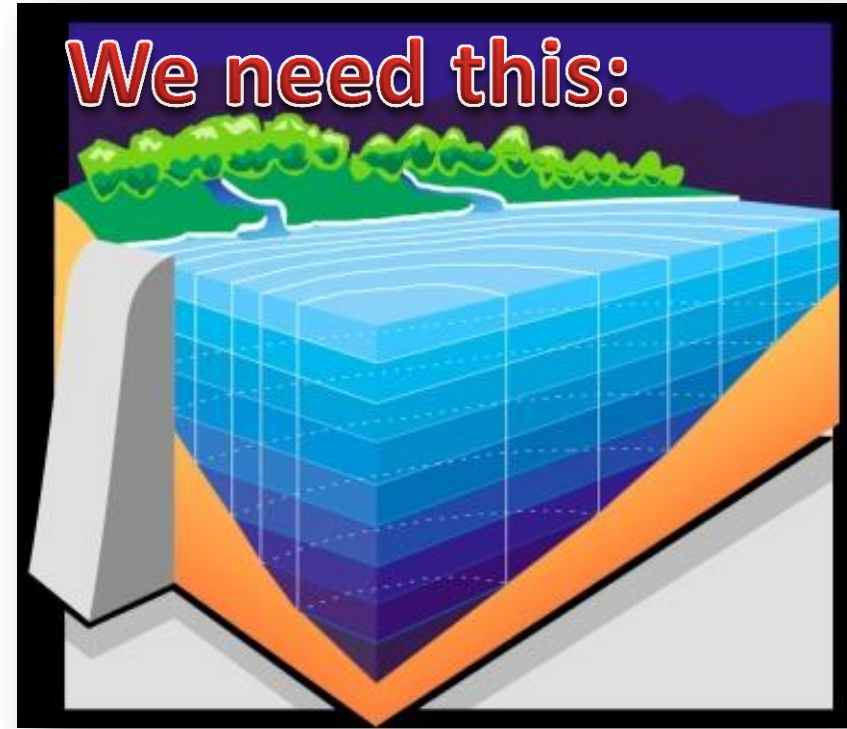
Lake Rotorua, 17 Aug. 2015, Landsat 8



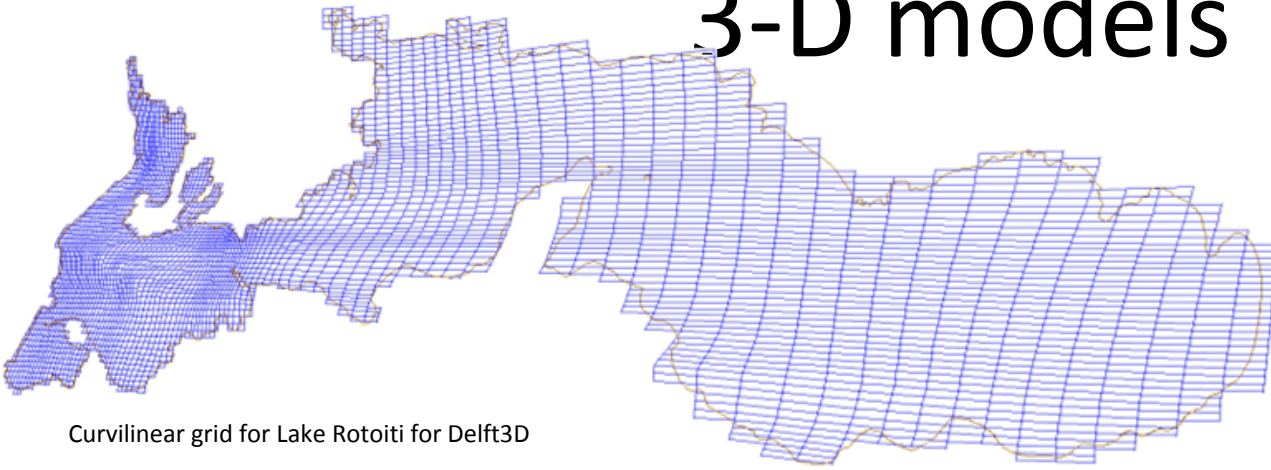
1-D models can not capture 3-D dynamics



Lake Rotorua, 17 Aug. 2015, Landsat 8



3-D models

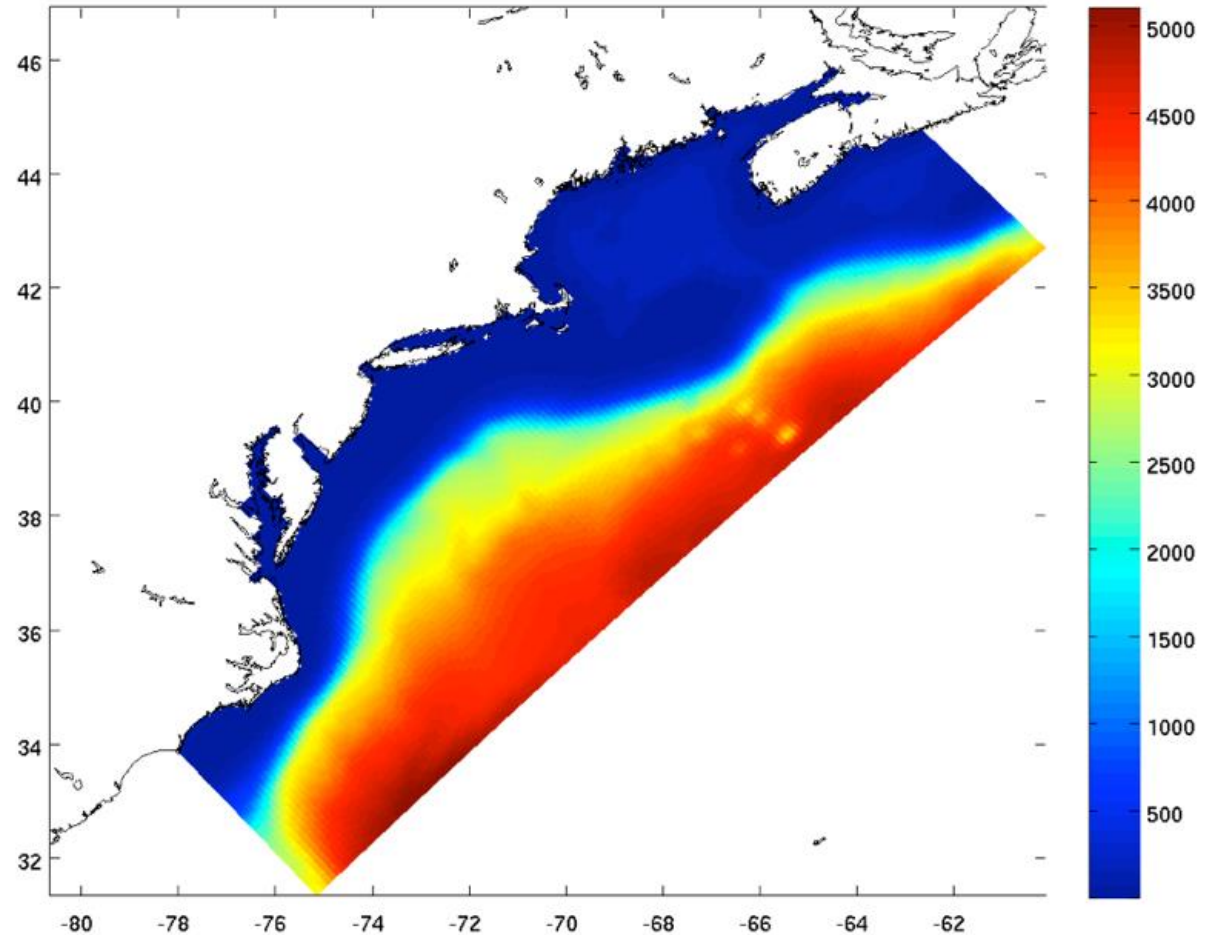


Curvilinear grid for Lake Rotoiti for Delft3D

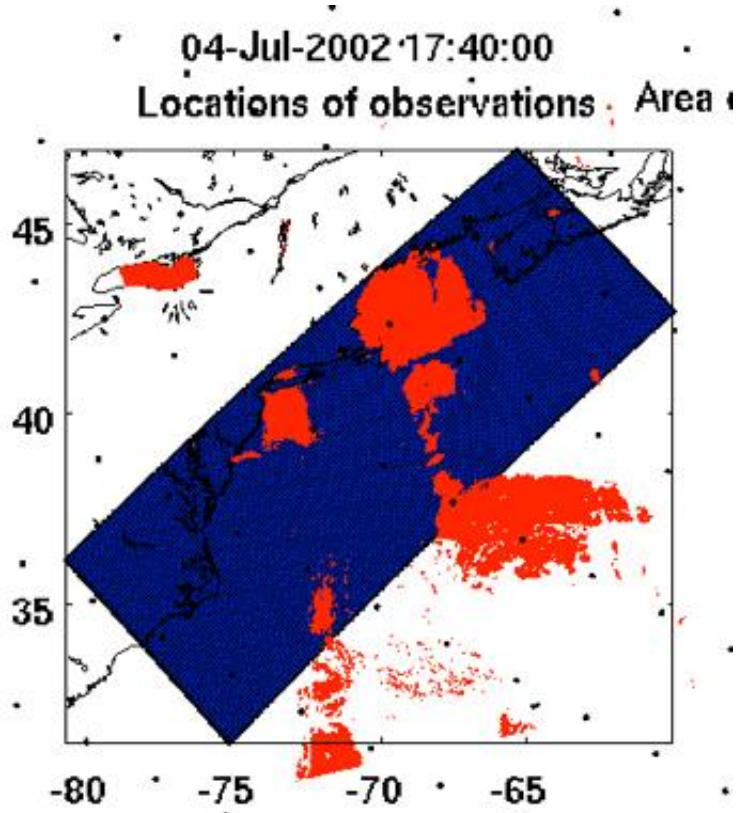


3-D models

- ROMS model of western North Atlantic
- 50 sigma layers
- NPPZZD ecosystem model
- 5 year simulation



Satellite observations of Chl are patchy



Biogeosciences, 6, 1961–1974, 2009
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Statistical validation of a 3-D bio-physical model of the western North Atlantic

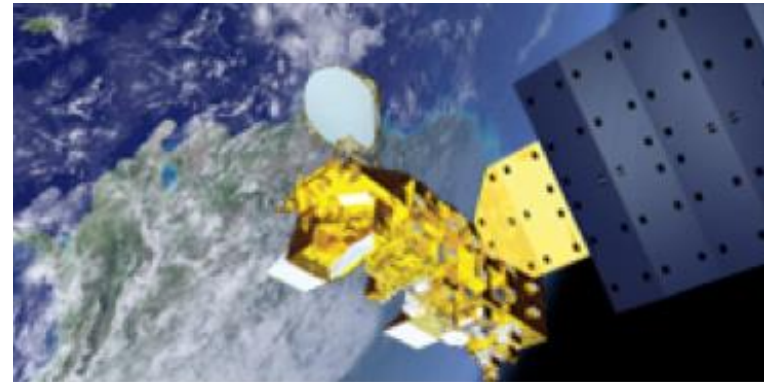
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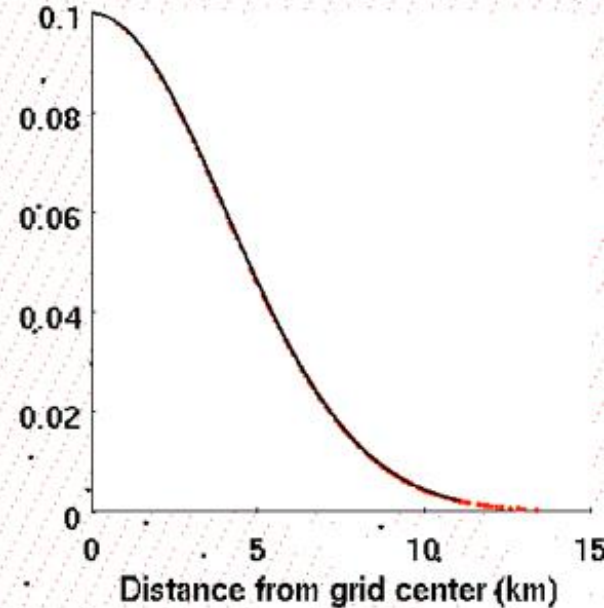
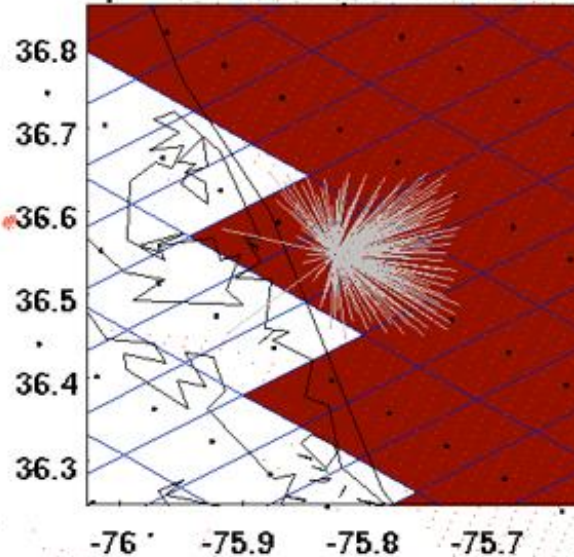
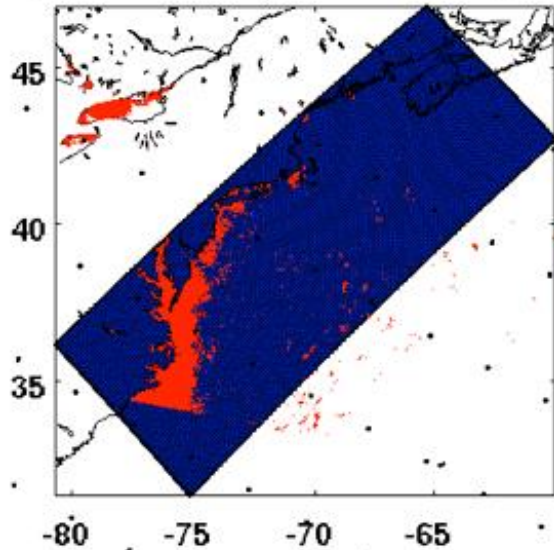


Satellite and model grids not equal

24-Nov-1997 17:35:00

Zoom into I = 76, J = 30

Locations of observations Area of influence around grid center is 0.1 deg (appr. 11 km) Gaussian weights, $\sigma = 4$ km



Satellite pixels without clouds

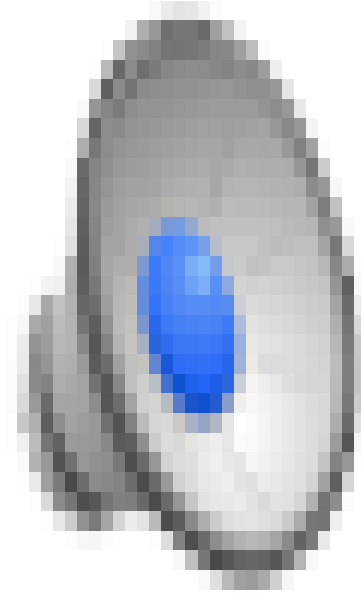
Satellite pixels near model grid cell

Weighting function for averaging satellite observations

Chlorophyll from satellite on
model grid.

Cloud cover makes model
validation difficult.

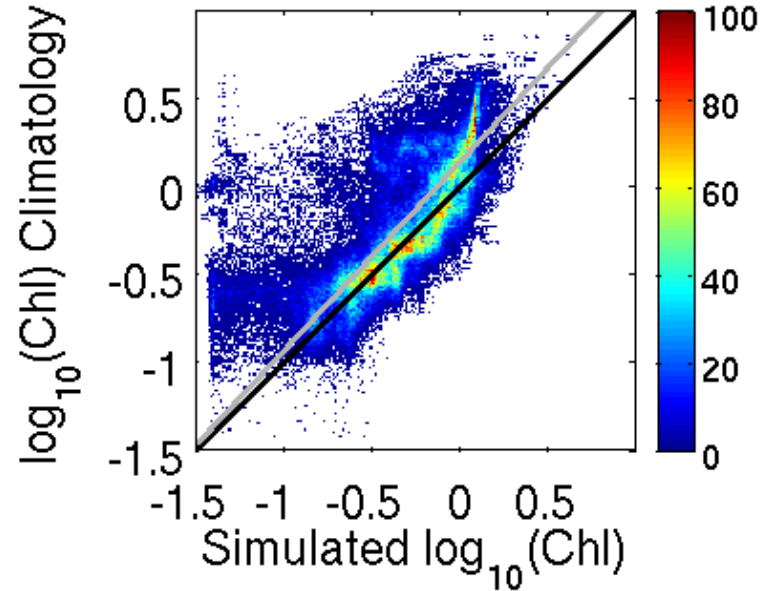
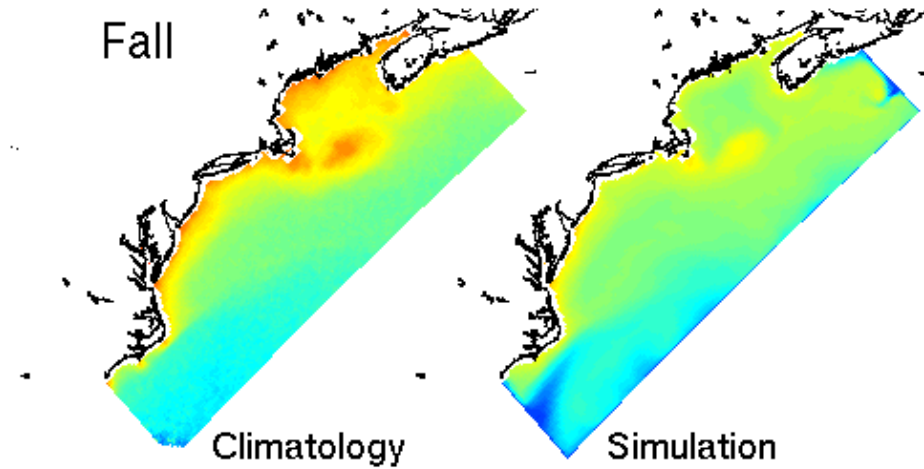
Seasonal averaging produces a
data field without gaps.



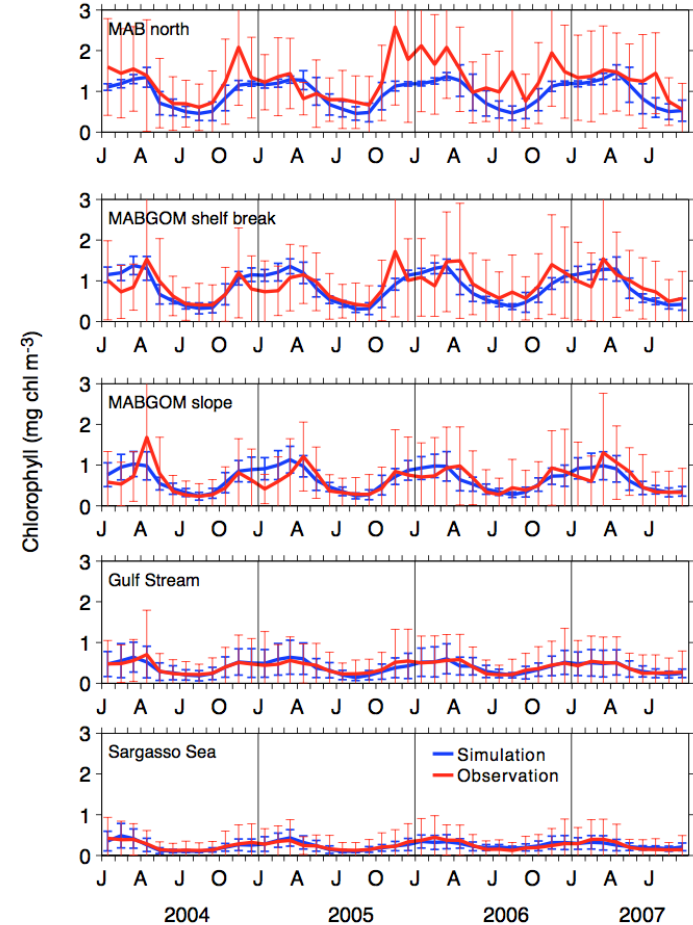
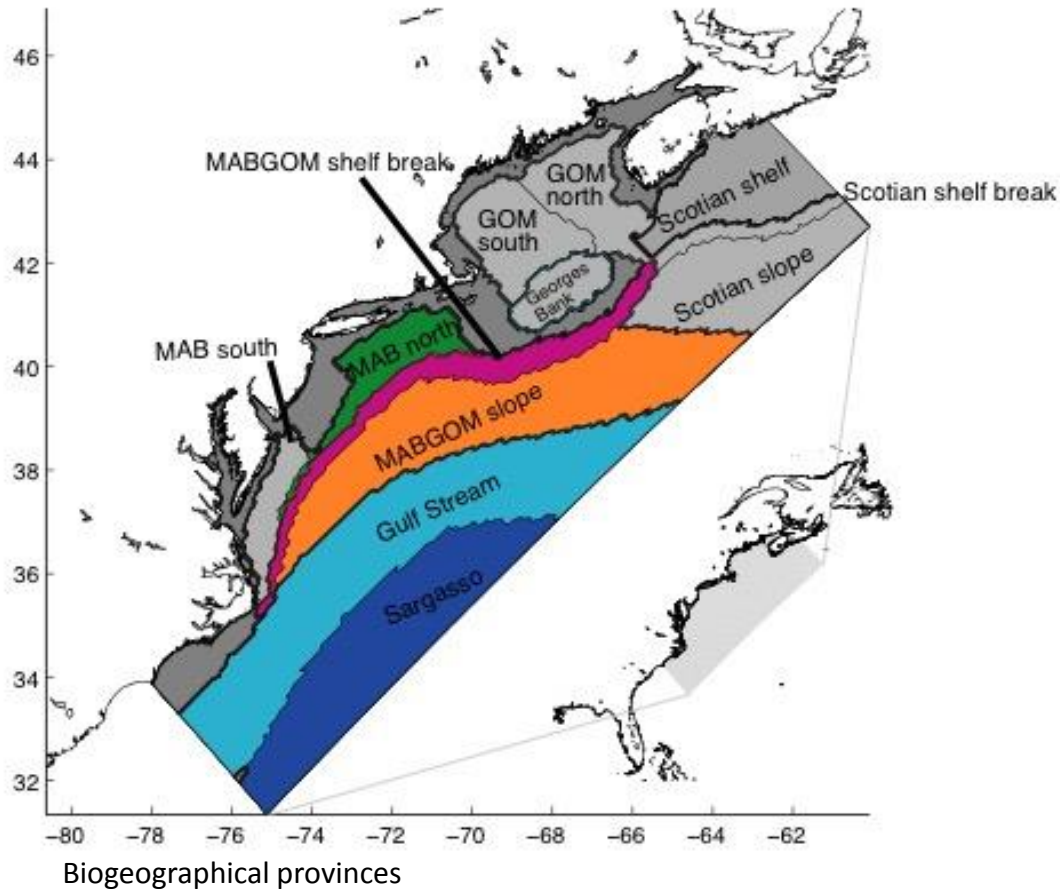
Model Validation

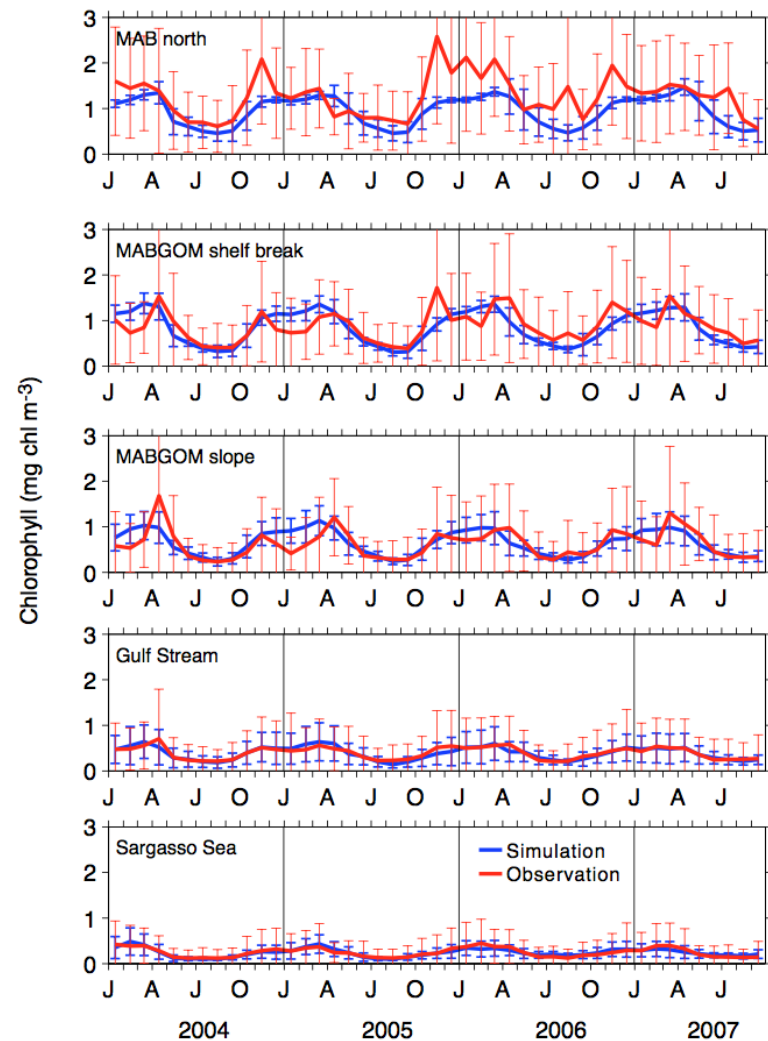
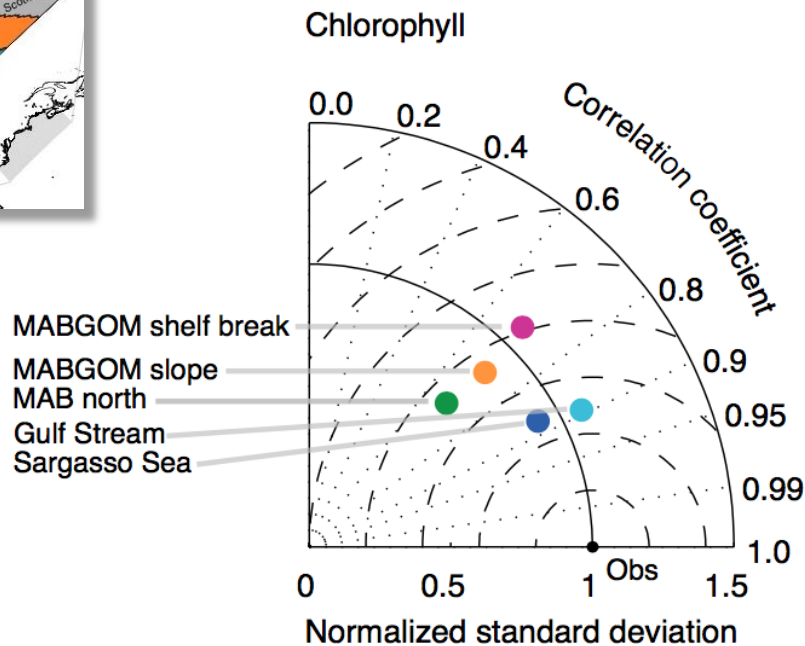
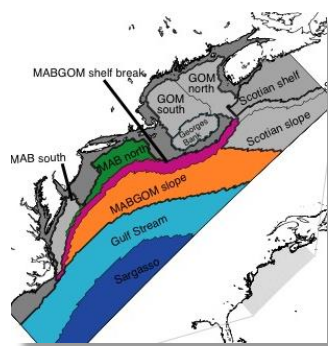
using long-term averages

Chlorophyll a (algal biomass)



Model Validation using time series of area average

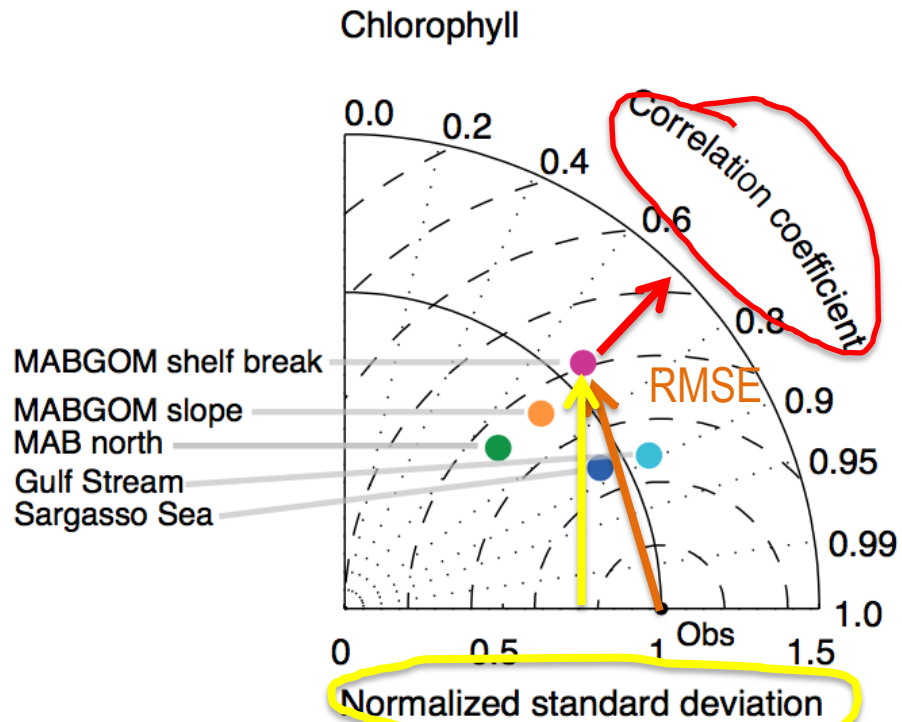




Taylor Diagrams

Fit statistics:

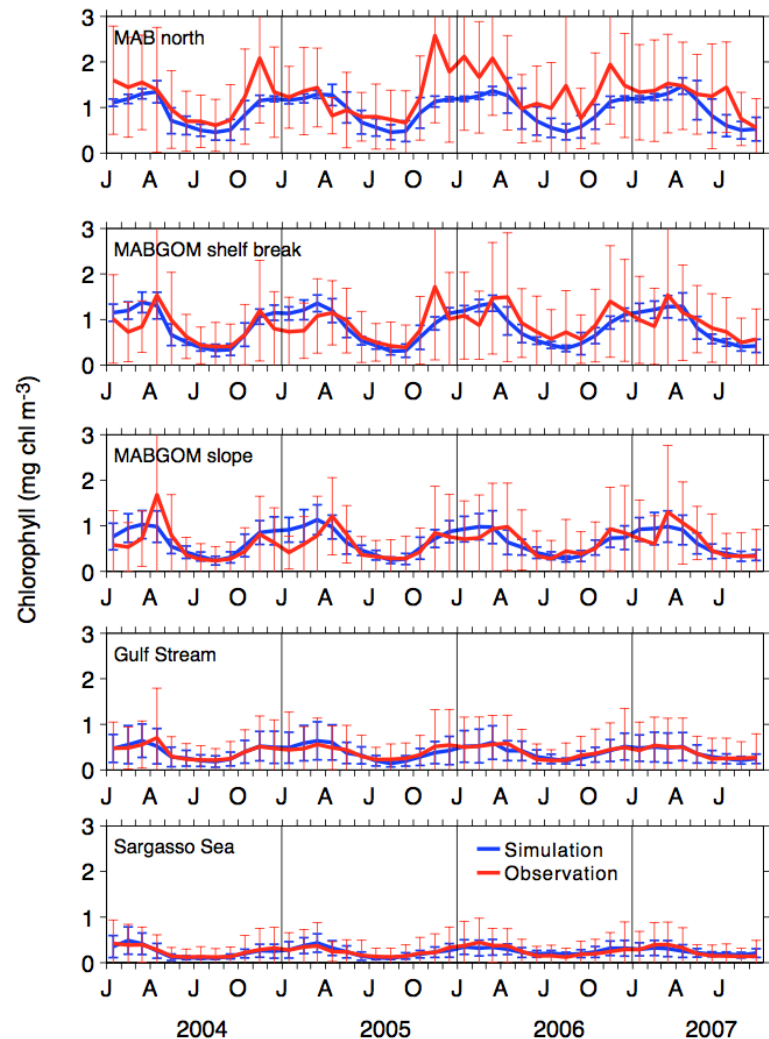
- Correlation coefficient
- Root mean square error
- Ratio of standard deviations



Taylor Diagrams

Fit statistics:

- Correlation coefficient
- Root mean square error
- Ratio of standard deviations





Thank you for listening,
thank you for your hospitality
and thank you for your excellent English!

Moritz Lehmann