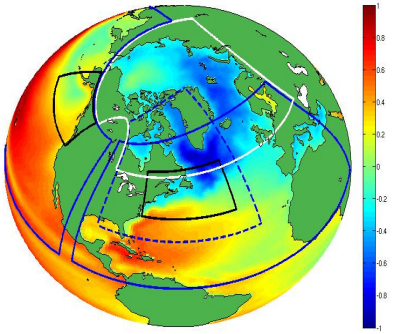
Inter-annual and Decadal Sea Level Variations: a Study Based on the CONCEPTS[1]/GOAPP[2] Coarse-Resolution Global Ocean Model

Y Lu, Z Wang, D Wright and F Dupont

[1] Canadian Operation Network for Coupled Environmental PredicTion Systems, a partnership of DFO-EC-DND, Universities, Mercator-Ocean

[2] Global Ocean-Atmosphere Prediction and Predictability, a CFCAS research network

NEMO Applications in Canada



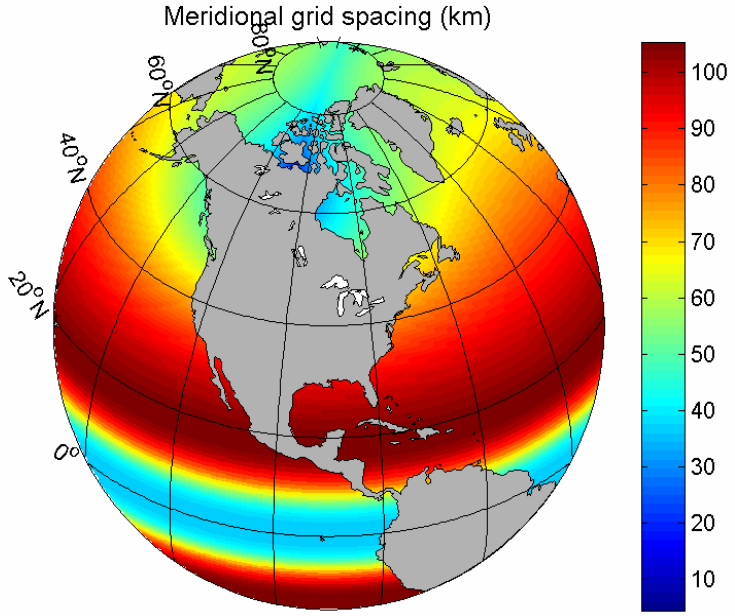
- Global -- BIO, RPNE, Dalhousie, U Quebec Montreal
- North Atlantic -- BIO, Dalhousie
- North Pacific -- IOS, Royal Military College
- Arctic and CAA -- BIO-CIS-Mercator, U Alberta
- North-western Atlantic -- CNOOFS, Dalhousie
- Gulf of St. Lawrence-Scotian Shelf-Gulf of Maine -- BIO, Dalhousie
- Gulf of St. Lawrence -- BIO, U Quebec Rimouski
- Great Lakes -- NWRI/RPNE, BIO

1º Global Ocean Model & Simulations

Model:

Horizontal: Global tri-polar grids; Nominal resolution 1° in lat/long; Meridional refinement in tropics;

Vertical: 46 vertical



Simulations:

10-yr spinup with COCR Normal Year forcing

CONTROL: CORE forcing 1958-2004

HEAT: wind stress set to Normal Year

WIND: buoyancy forcing set to Normal Year

MJO: wind stress = Normal Year + MJO

See also presentations by

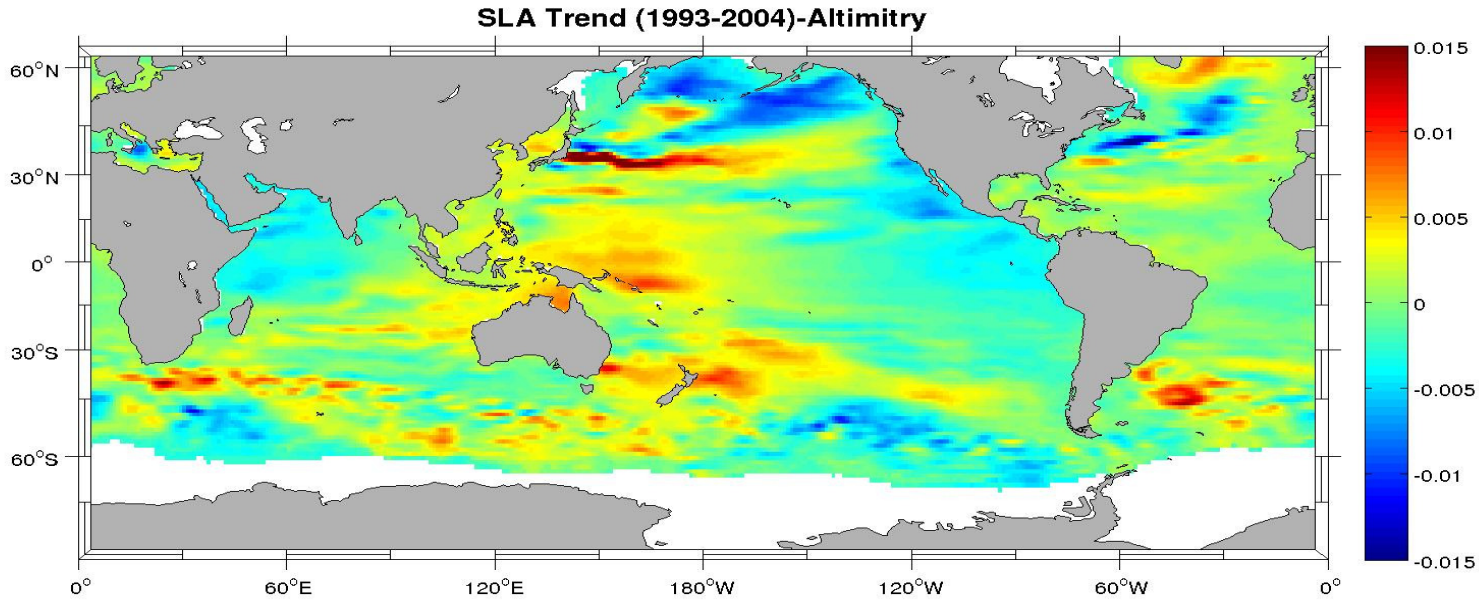
Z Wang 1D-301.1

X Zhang 1C-301.2

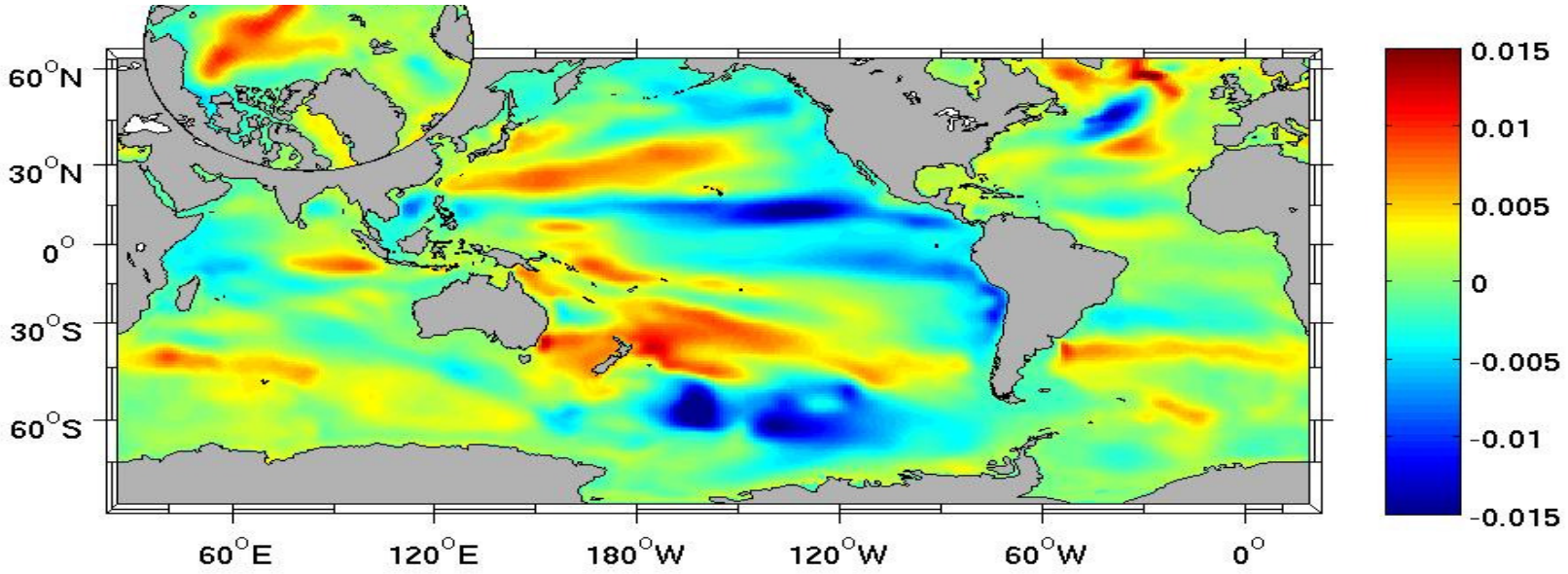
F Dupont

Sea-Level Trend 1993-2004 (m/yr)

Obs

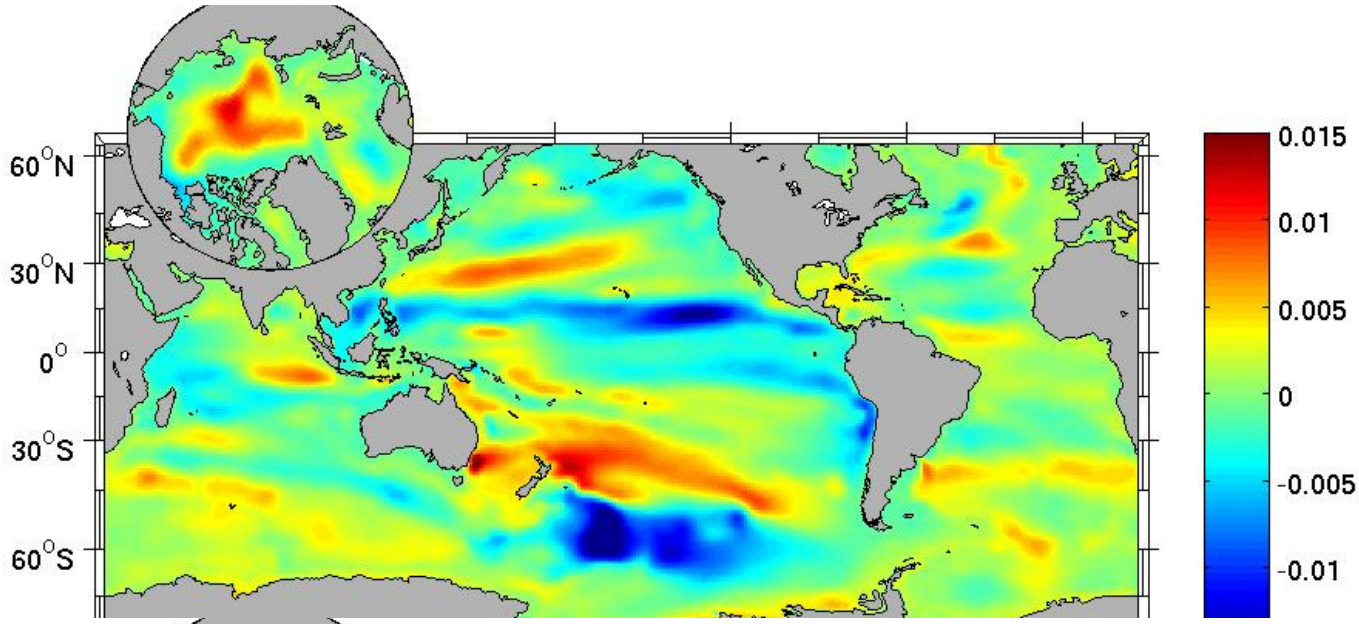


Model

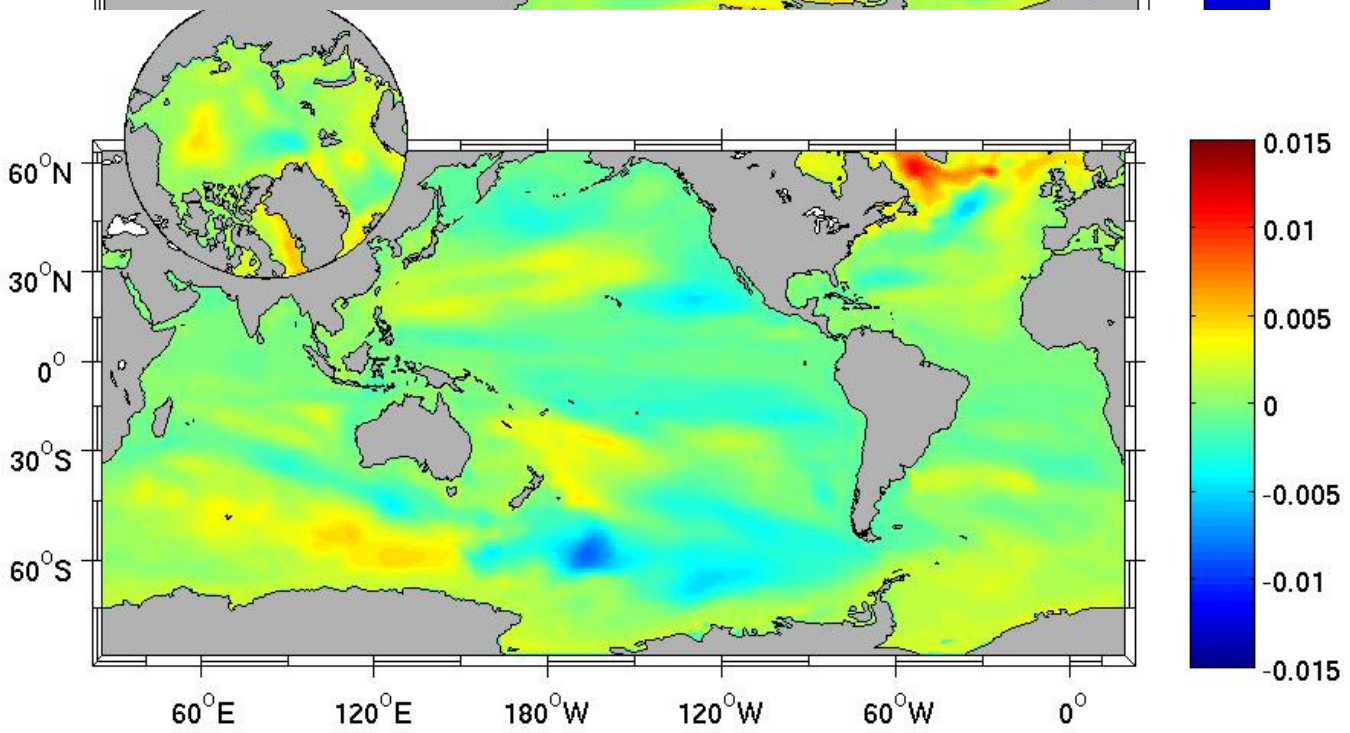


Forcing sensitivity

Wind

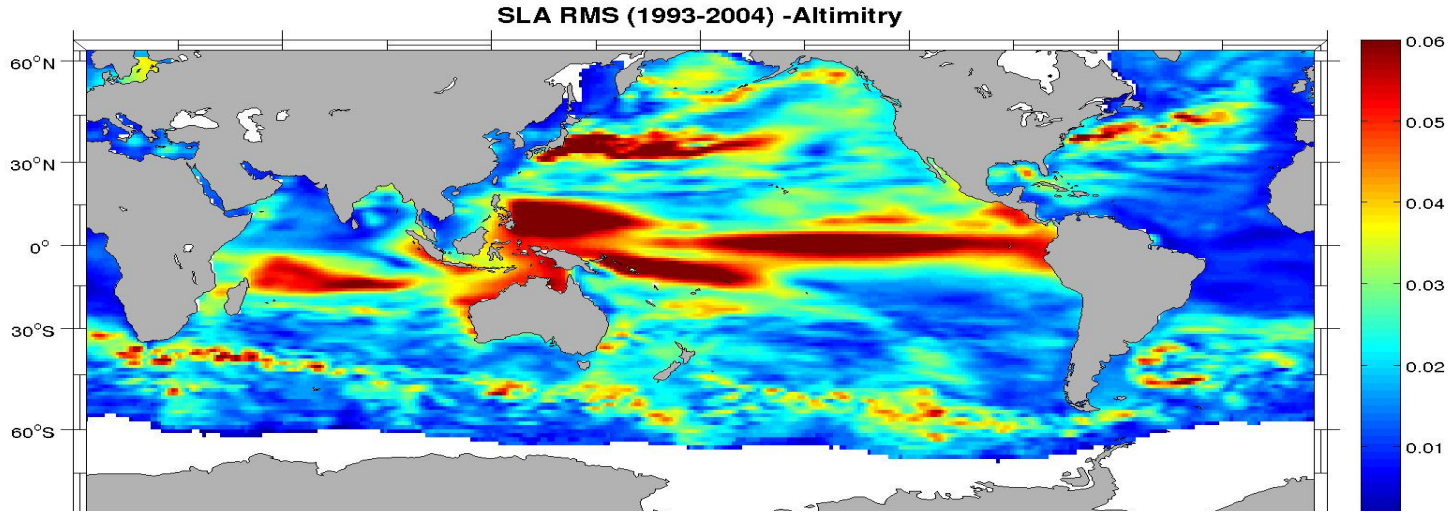


Heat

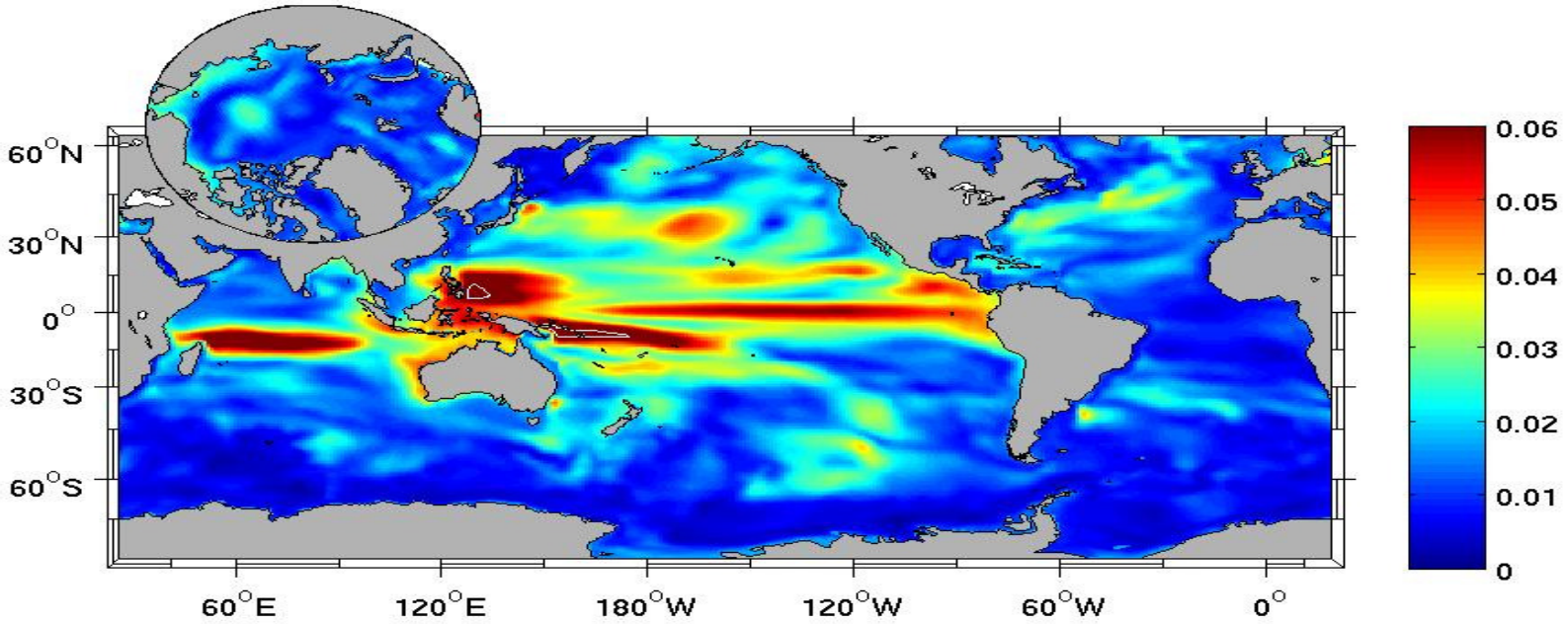


Inter-Annual Sea-Level RMS 1993-2004 (m)

Obs



Model



Forcing sensitivity

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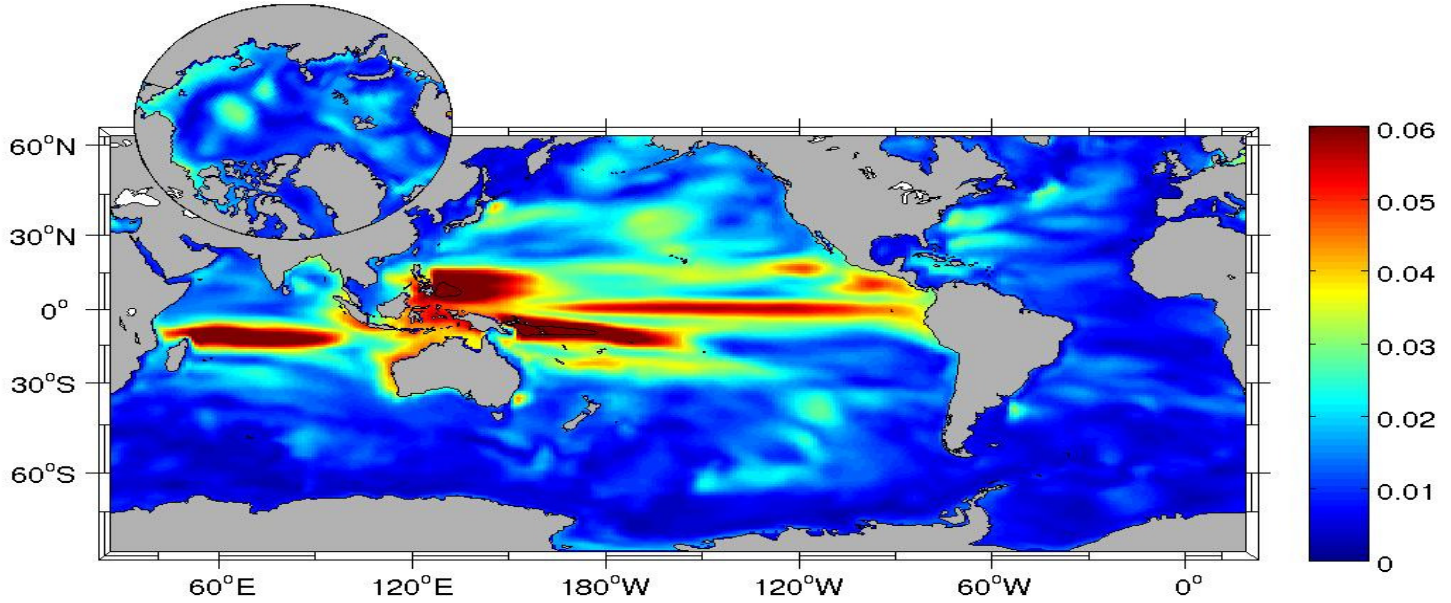
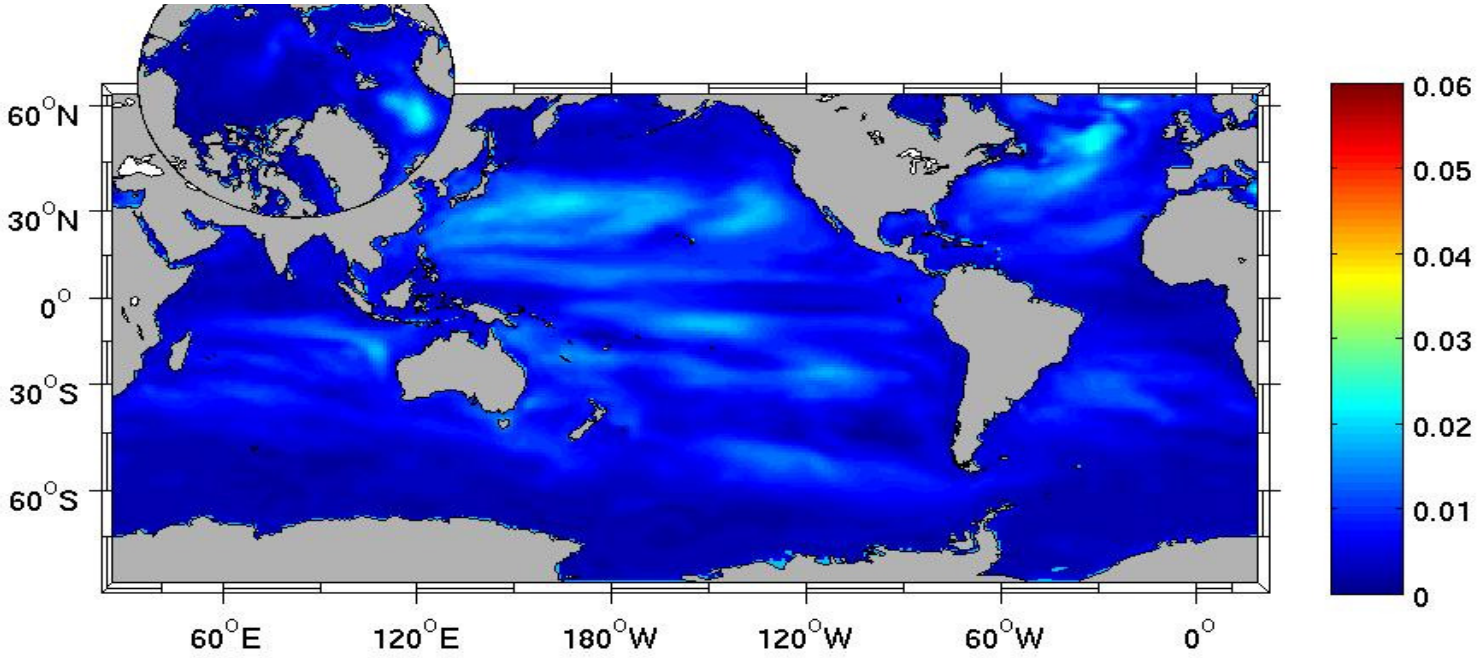
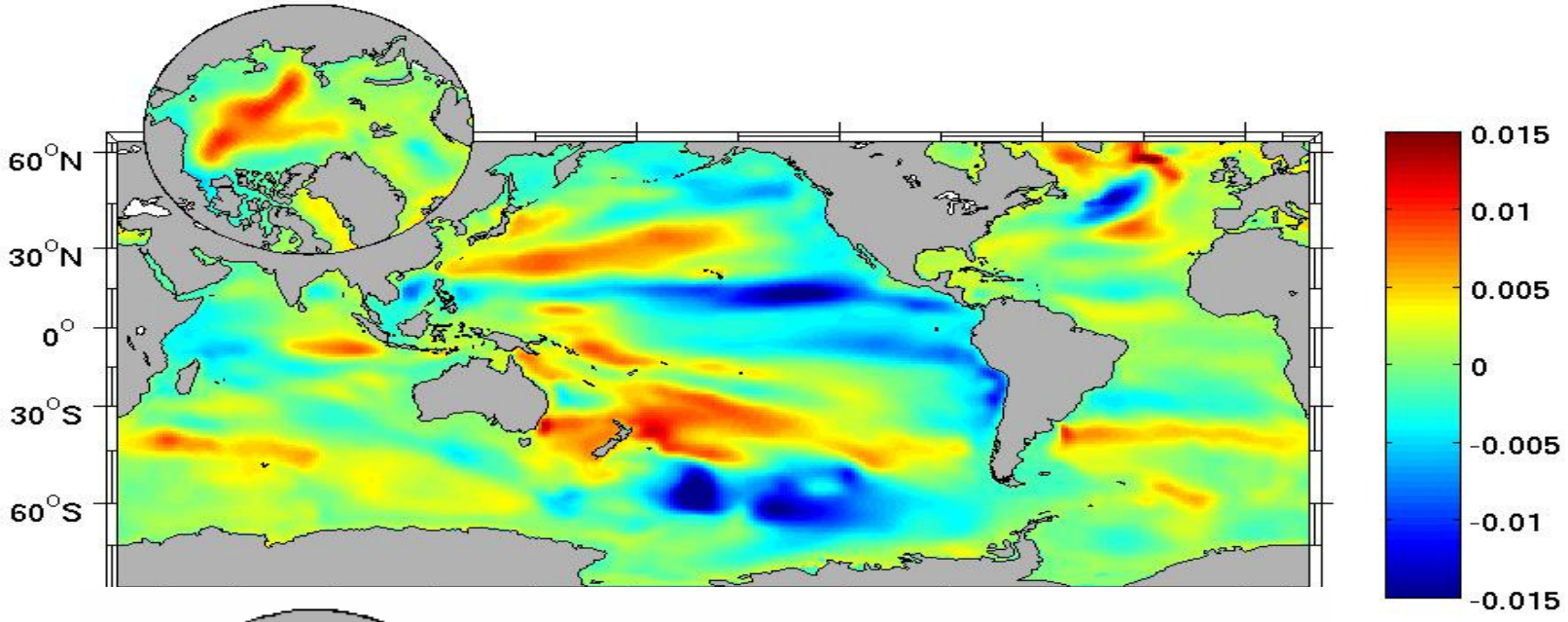


Heat

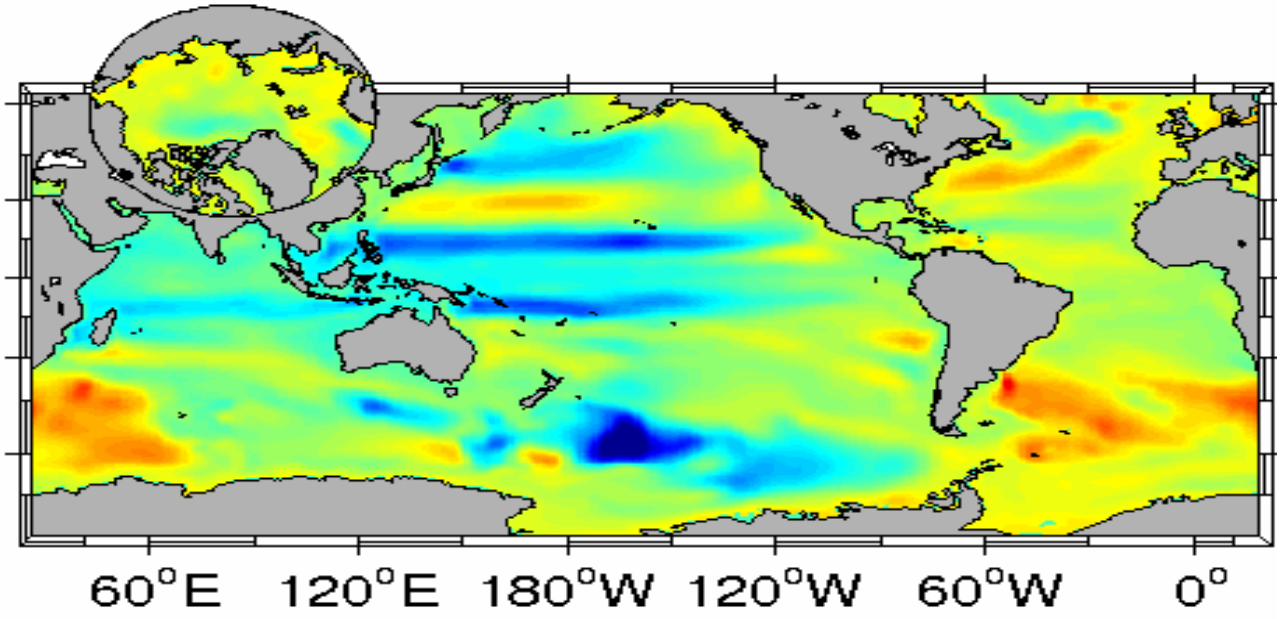


Sea-Level Trend (m/yr)

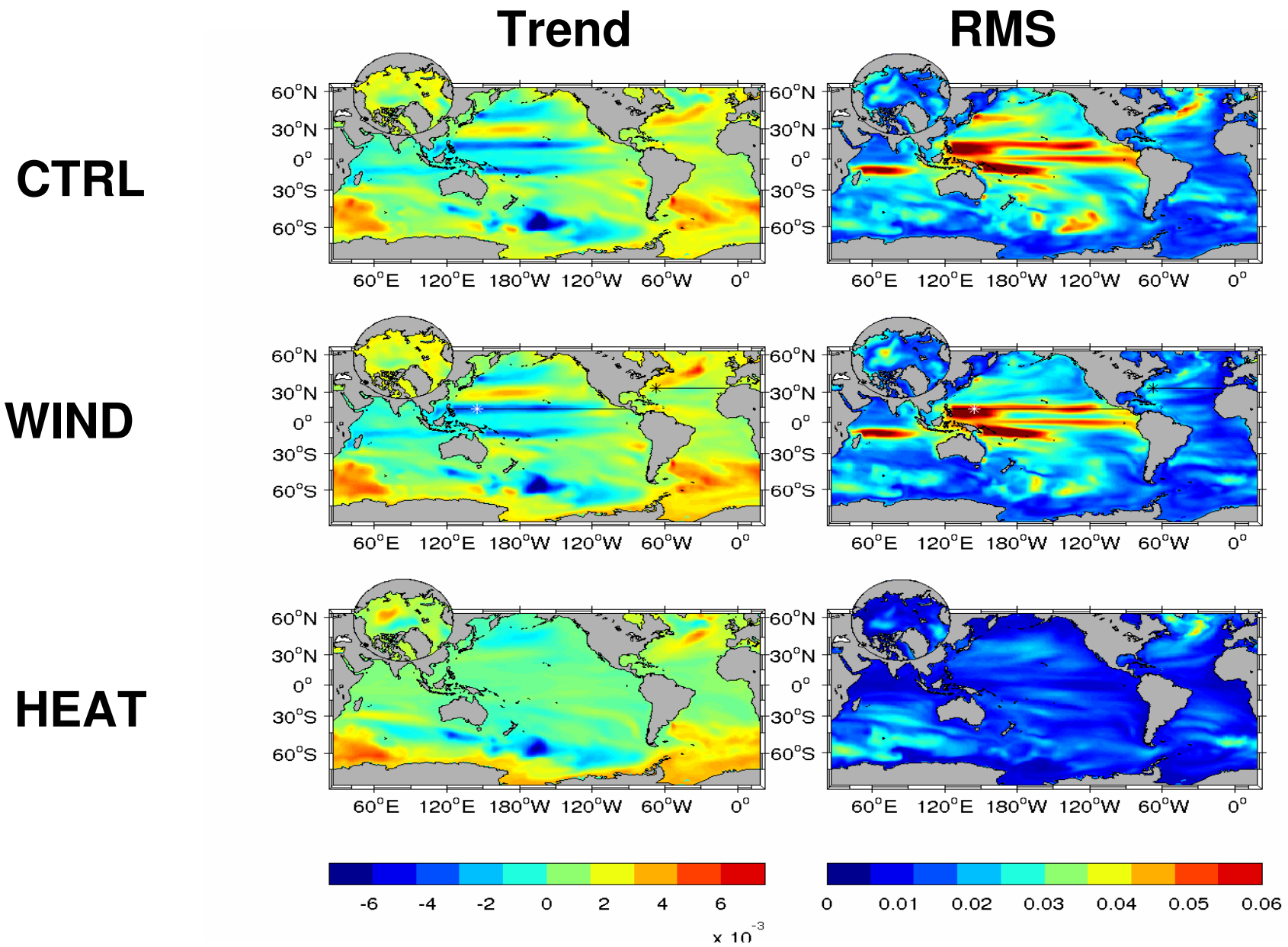
1993-2004



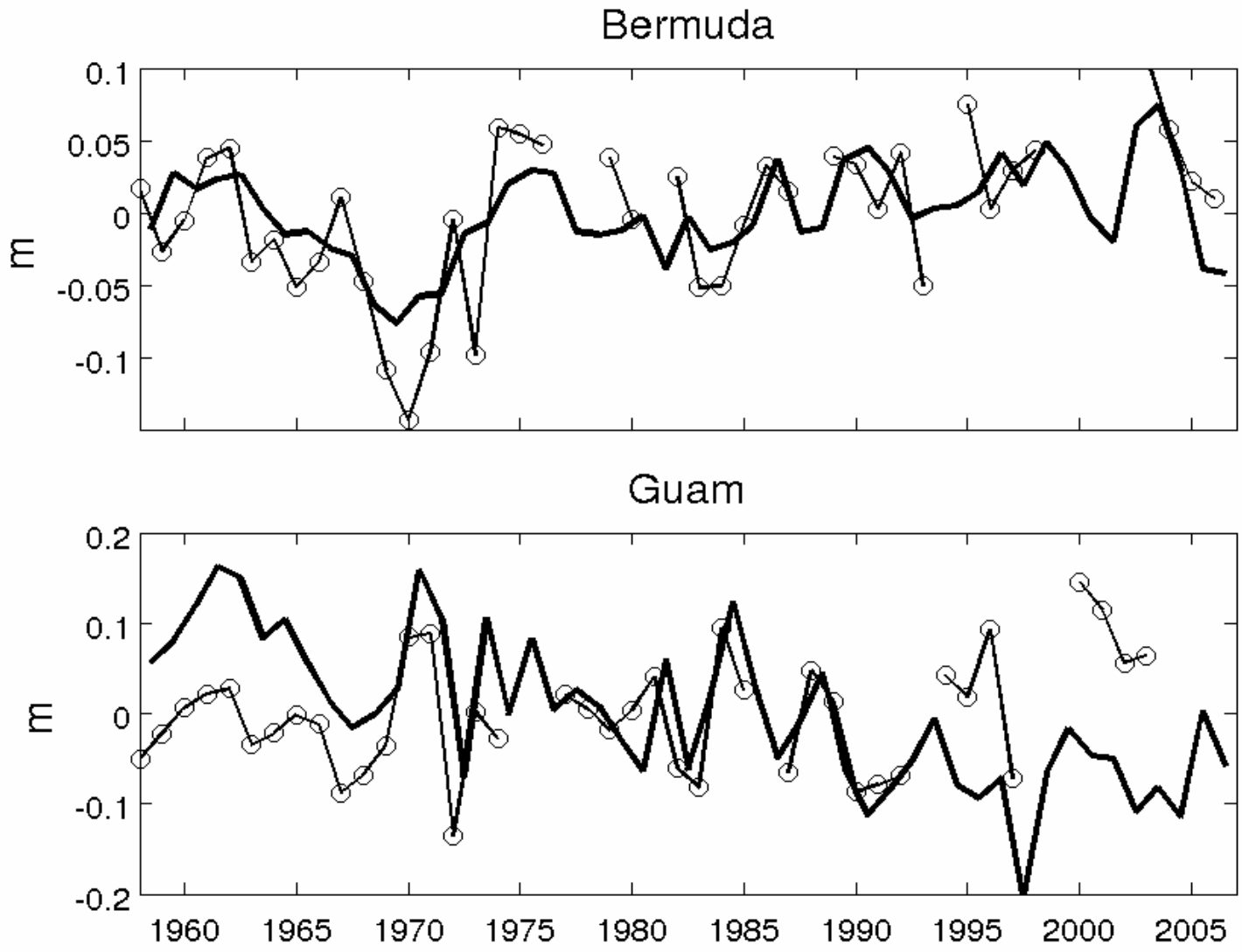
1965-2004



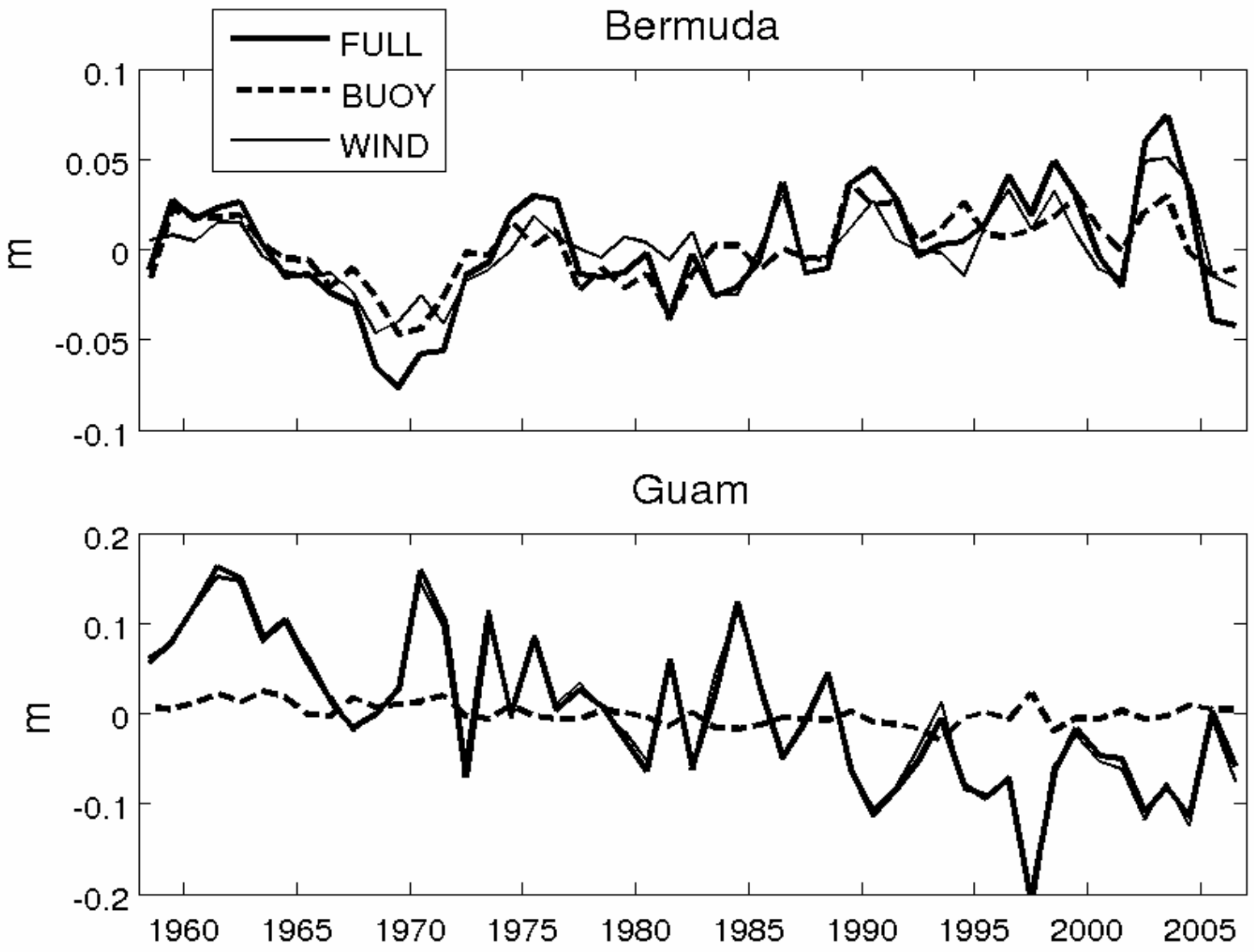
1965-2004: Sea-Level Trend & RMS



Mid-Latitude Variability



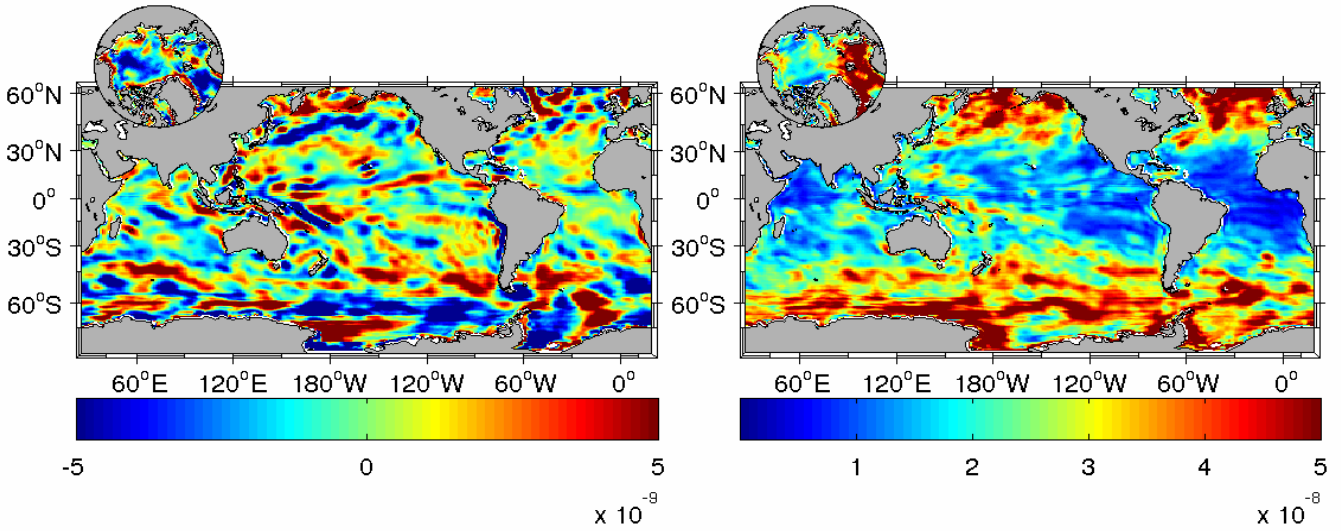
Forcing sensitivity



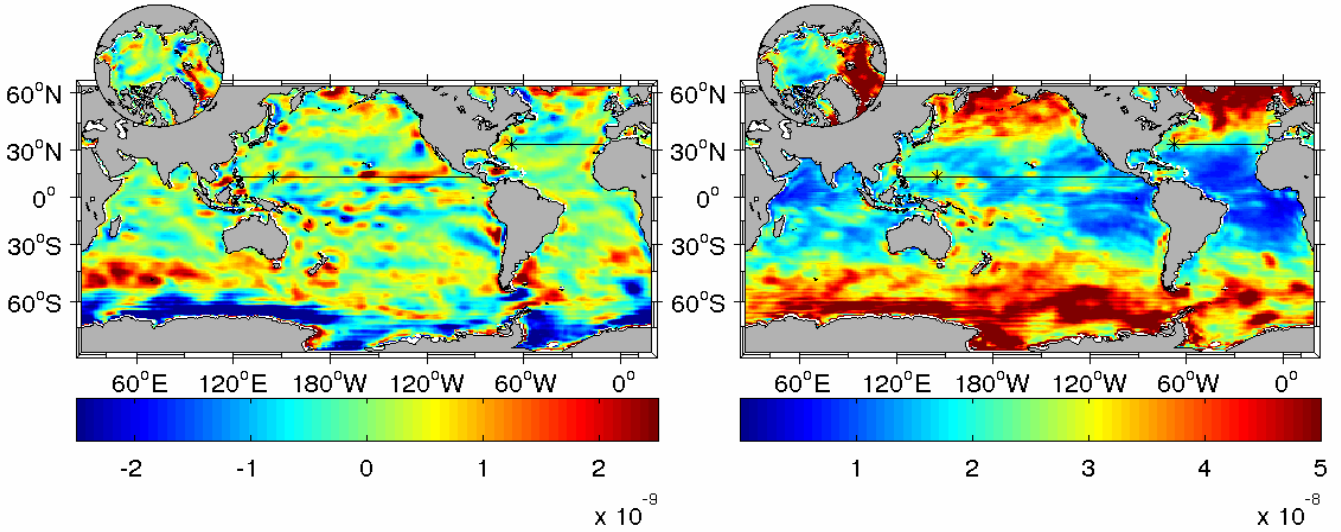
Wind Stress Curl: Trend & RMS

Trend **RMS**

1993-2004



1995-2004



Summary

- **Global 1º model able to reproduce large-scale SSH changes during altimeter era**
- **SSH trends during 1993-2004 and 1965-2004 significantly differ**
- **Wind stress changes are primary cause of SSH trend and RMS at low and mid latitudes; impacts of buoyancy forcing mainly show at high latitudes**
- **Discrepancy between model and observations could be due to model error (e.g., coarse resolution), or forcing**
- **1º NEMO is being coupled to 100 km GEM; expected to be a good tool for study/prediction of intra-seasonal/seasonal variations**