SEASONAL- TO- INTERANNUAL OCEAN VARIABILITIES: COMBINING ALTIMETRY AND MODELS

I.Fukumori, R.Giering, T.Lee, D.Menemenlis, and L.- L.Fu

JPL

OBJECTIVES

Understand seasonal- to- interannual changes of the Pacific Ocean

APPROACH

Assimilate altimetry and in situ data with models.

MODEL

MITgcm, global domain, high resolution (Δz=10m, Δy=1/3°), with advanced mixing schemes (GM & KPP).

ASSIMILATION METHOD

Kalman Filter/Smoother & Adjoint Method

INTERIM PROGRESS

- Model uncertainty assessment
- Kalman filter derivation
- Adjoint model development

ANTICIPATED RESULTS

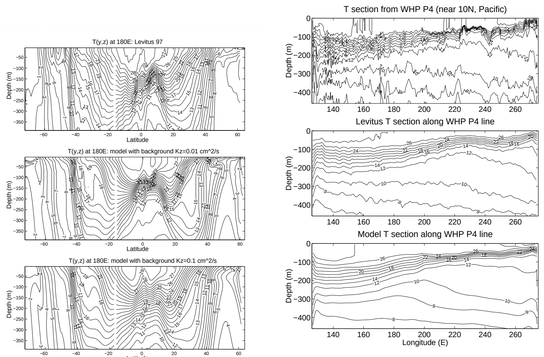
"Rigorous" routine (weekly) analysis of global ocean circulation.

SUMMARY

Model uncertainties (forcing, parameters, topography) are carefully assessed to effect an accurate assimilation.

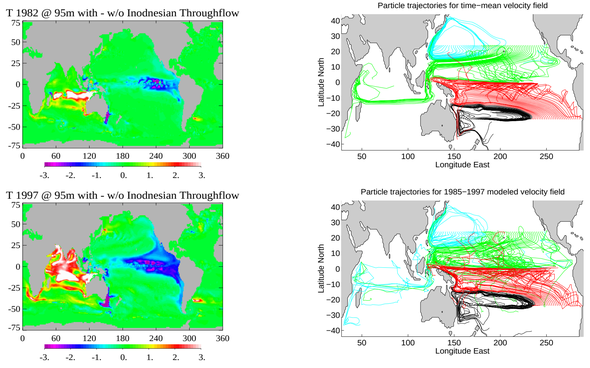
The model mean appears to be as dependent on parameters and topography (including accurate representation of straits and passageways) as it is on atmospheric forcing.

A Kalman Filter/Smoother and Model Adjoint are being constructed to optimize the identified model deficiencies and to synthesize the diverse observations.



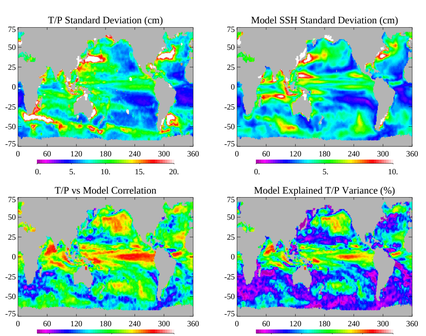
TEMPERATURE SECTIONS

Model is sensitive to mixing parameters (LEFT). Note superior similarity of model thermocline to WOCE section than that of climatology (RIGHT).



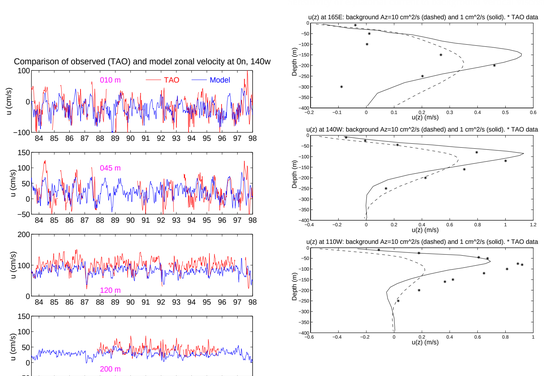
PASSAGES and PATHWAYS

Model hydrography is dependent on accurate representation of straits and passages (LEFT). Pathways of subducted water masses critically depend on variabilities of the circulation (RIGHT).



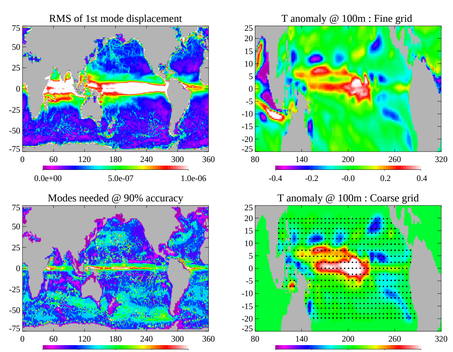
SEA LEVEL VARIABILITY

Model is well correlated with T/P, accounting for a significant fraction of the observed variability.



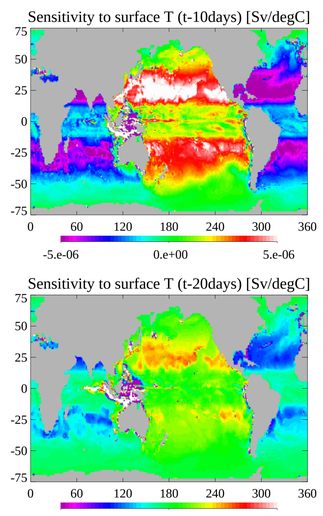
CURRENTS

Model is fairly accurate in magnitude and phase of the currents (LEFT). Model mean is sensitive to friction (RIGHT).



KALMAN FILTER DESIGN

Model and data are analyzed so as to design an effective Kalman filter. Dynamic modes are used to resolve dominant adiabatic variability.



SENSITIVITY ESTIMATE BY MODEL ADJOINT

The model adjoint is used to estimate sensitivity of the circulation (Indonesian Throughflow) to changes in the model state (surface temperature).