

Comparing sea-surface topography modes of variability from altimetry and global models

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COMPARING SEA-SURFACE TOPOGRAPHY MODES OF VARIABILITY FROM ALTIMETRY AND GLOBAL MODELS

Bernard BARNIER Thierry PENDUFF

Filtered

Model and

Observed

SLA(x,y,t)



2° MODEL

Mixing, GM90

Mixing

+ CFC/14C tracers

SAME FORCING

FOR THE 2° AND

THE 1/4°

SIMULATIONS

Statistical

Analyses

Variances

Correlations,

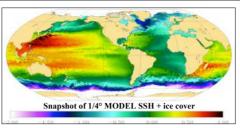
EOFs. etc

Mélanie JUZA

DRAKKAR



The international DRAKKAR program is building a hierarchy of ocean/sea-ice/passive tracer models to simulate and study the dynamical processes involved in the oceanic variability and scale interactions. This ensemble includes 1/2° and 1/4° configurations of the Global Ocean, 1/4° and (soon) 1/12° models of the Atlantic Ocean (30°S-80°N), all forced over the period 1950's-present by various reanalysed and observed atmospheric fields through bulk formulae. Reanalyses since 1950 will be conducted at Mercator with the 1/4° global model.



AVISO

SLA(x,y,t) database

MODEL

asiglobal, 1993-2004

PROCESSING

Trilinear collocation

on 1/3°x1/3°x7day AVISO Map

Mask AVISO under MODEL Ice

Mask MODEL under AVISO Ice

· Linear detrending of full datasets

• Remove 1993-1999 means

· Remove spatial averages

Laplacian momentum NEMO code (OPA9 ocean + LIM sea-ice) Partial steps+BBL, TKE mixed laver (waves+Langmuir cells) 1/4° MODEL · Advection: enstr./energy conserv. (momentum). FCT (tracers) Biharmonic momentun · Isopycnal laplacian tracer mixing.

Space-Time Lanczos Filtering

Basin scale

Regional

1958-2004 FORCING (Brodeau, Barnier et al)

GLOBAL MODEL SETUPS

Collocated

Model and

Observed

SLA(x,y,t)

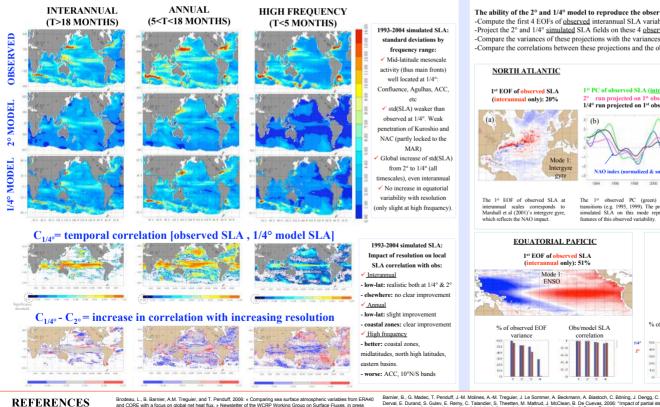
· CORE bulk formulae. Dai & Trenberth monthly runoffs. 6-hourly ERA40 (T.g.wind) + CORE LW/SW radiative fluxes No SST restoring. But SSS restoring (τ=36 days on 1st level)

ABSTRACT

The quasi-global sea-level anomaly AVISO altimetric database (weekly SLA, 1993-present) is compared with its collocated counterparts simulated by the models in various wavenumber-frequency bands. This assessment concerns the structure&intensity of the leading modes of variability at global and basin scale, the part of the observed SLA variance simulated by the model (and their mutual correlation), and local investigations of the simulated and observed variabilities in selected regions. We discuss realism of the variability simulated by the 2° and the 1/4° global models with the same forcing, and the sensitivity to resolution is commented. More generally, this validation procedure is applied to all DRAKKAR simulations to guide physical investigations, characterize the structure of model biases, and assess the impact of numerical and physical choices.

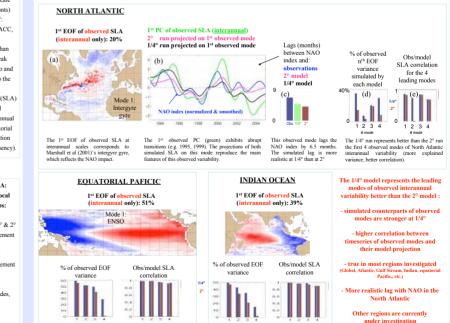
See the Poster by Penduff, Juza, Barnier concerning validation against hydrography

GLOBAL Std(SLA) BY FREOUENCY RANGE (cm)



MODES OF INTERANNUAL VARIABILITY

The ability of the 2° and 1/4° model to reproduce the observed interannual variability is compared in various regions as follows: -Compute the first 4 EOFs of observed interannual SLA variability in key regions (1st observed N.Atl. mode shown in Fig a. associated PC is green in Fig b) -Project the 2° and 1/4° simulated SLA fields on these 4 observed modes (time series of these projections shown for the 1ª mode in Fig b for the two runs) -Compare the variances of these projections with the variances of each observed mode (shown in Fig d) -Compare the correlations between these projections and the observed PC of each observed mode (shown in Fig d)



Derval, E. Durand, S. Gulev, E. Remy, C. Talandier, S. Theetten, M. Maltrud, J. McClean, B. De Cuevas, 2006: "Impact of partial steps and momentum advection schemes in a global circulation model at eddy permitting resolution", Ocean Dynamics, in press.

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