Seasonal Prediction

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Plan

- 1. Seasonal prediction
- 2. Current system (PEODAS/ALI)
- 3. Plans for coupled assim + prelim results



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Seasonal Prediction Strategy



Hind-casts over past 20-50 years

Model bias large -> need use hind-casts to calibrate real-time forecasts

Hind-casts also used for statistical bridging/downscaling

Need re-analysis over past 20-50 years consistent with model (ocean/atmos/land)

Due to calibration hindcasts (& and re-analyses) need to be consistent with real-time system (&stationary)

Because of model biases need best initialisation system that leads to best forecast skill and not best state estimate





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Ocean data assimilation systems for seasonal prediction

ECWMF System 3: POAMA: JMA:	Multivariate OI Pseudo EnKF Multi-variate 3D Var		
		GODAS (NCEP):	3D VAR
		Mercator:	Reduced order Kalman Filter
UKMO:	ΟΙ		
NASA:	OI and EnKF		
GFDL:	EnKF (semi coupled)		

Variables: Temperature (all), Salinity (some), altimeter (some)



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PEODAS

POAMA Ensemble Ocean Data Assimilation System (Yin et al 2010)



Ensemble Spread



Temperature

Salinity



Yin et al 2010













Salinity assimilation

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Significant covariance between T & S particularly associated with thermocline variability

This can be exploited pre Argo

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Produced by

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POAMA-2 Skill Comparison

Anomaly correlation versus lead time

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El Nino (Nino3.4)



Black-POAMA-1.5 **Green-Sintex** Blue- ECMWF sys 3 Dash-persistence



POAMA-2 Initialisation Strategy: Atmosphere and Land

Cannot use existing re-analyses/NWP directly – non stationary Cannot do own re-analyses – too costly Simple nudging scheme – ERA-40/BoM operational Tquv Land surface through atmosphere





Coupled Assimilation



Coupled Assimilation

PEODAS system extend to Coupled Assimilation Similar approx – GDFL ENKF but atmos obs used

Plan to use atmosphere obs from reanalysis/NWP (as in ALI)

A different way of merging 4DVAR in atmos with EnKF coupled mode

Generates ocean/atmos/land ensemble perturbation

Feasible to go back to 1960

EnKF like projecting obs onto model ensembles (balance and reduce shock since uses model as filter)

Start with cheap version of ACCESS coupled model (N48 + Baby AusCOM + CABLE?)



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ENSO Predictability 1997 El Nino case study (Shi et al 2008) 90 forecasts starting 1st Dec 1996 ~0.001C perturbation to initial SST Nino3.4 ens_mea_ini=19961201 3.5 Estimate covariances 3 from ensemble e.g. after 2.5 one month 2 1.5 0.5 0 -0.5 -1 -1.5 APR ост JAN 1998 JÚL 1996 ост JAN 1997 JÚL

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POAMA ____ predictive ocean atmos

Covariance and cross covariance

Using reference Temperature increment on dateline and thermocline



By Trish Okely and Debbie Hudson

Covariance and cross covariance

Using reference SST increment In Indian Ocean



By Trish Okely and Debbie Hudson

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Covariance and cross covariance

Mid-latitudes







Summary

Present Assimilation

- PEODAS Pseudo EnKF significant improvement in skill
- Balanced covariances (e.g. salinity)

Coupled Assimilation

- Coupled assimilation using extension of PEODAS (Pseudo Ensemble Kalman Filter)
- Preliminary investigation shows dynamically consistent features

Coupled assimilation Issues

- how realistic are non local covariances,
- do they matter anyway with when have lots of atmos obs
- How much localisation and how to apply (particularly in vertical)
- Exciting studies ahead



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