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Centre for Australian Weather
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CSIRO

Seasonal Prediction with POAMA

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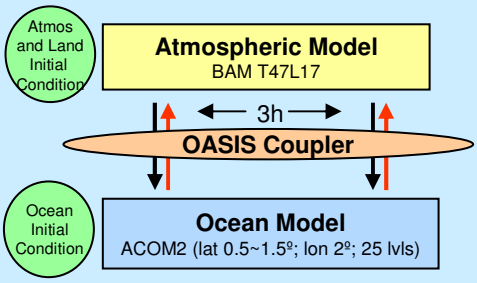
POAMA: Dynamical coupled seasonal forecast system

- POAMA-1 operational in 2002
- POAMA-1.5 is the current version (operational since Jan 2008)
  - hindcasts: 10 member ensemble, 9-month forecasts, 1980-2006, started on the 1st of the month.
- POAMA-2 – hindcasts being run

poama.bom.gov.au



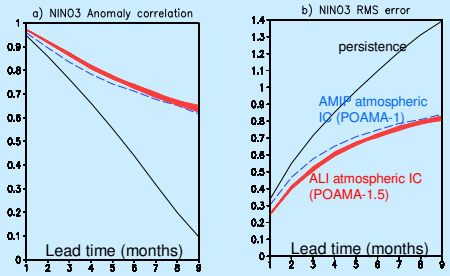
Progress with Initialisation

Atmosphere and Land

POAMA-1: AMIP-type initial conditions

POAMA-1.5: **A**tmosphere-**L**and **I**nitialisation Scheme (ALI) (Hudson et al 2009).

ALI: A forecast-analysis (or nudging) scheme is used to produce the atmospheric and land surface initial conditions (IC). Offline POAMA atmospheric GCM forced by weekly sea-surface temperatures is nudged towards "reality" (ERA-40 for hindcasts; NWP for real-time) to create the IC.



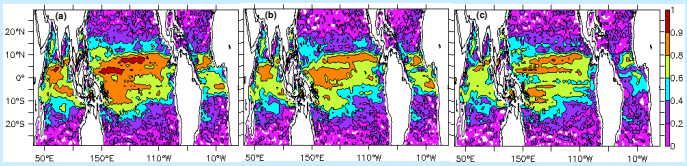
As such, more realistic initial conditions from ALI produce improved seasonal forecasts over the equatorial Indo-Pacific. Although the atmosphere has a short-term memory, atmospheric IC can excite a coupled response than can have a long-lasting impact on the forecast.

Ocean data assimilation

POAMA-1.5: Univariate optimal interpolation (Smith et al 1991)

POAMA-2: **P**OAMA **E**nsemble **O**cean **D**ata **A**ssimilation **S**ystem (PEODAS) (Yin, Alves, Oke)

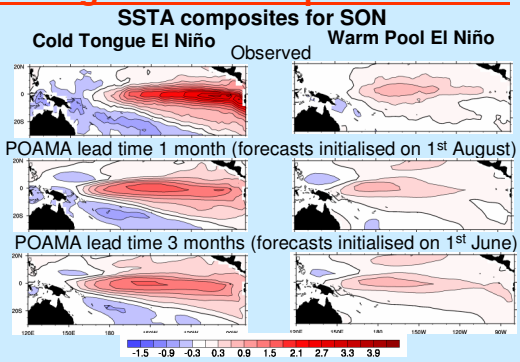
PEODAS: PEODAS is a variation of the Ensemble Kalman Filter (EnKF). It includes the routine generation of an ensemble of forecasts, and a state-dependent estimate of the background error covariance. PEODAS differs from traditional EnKF systems in that only a single analysis is computed for a central forecast. This analysis is calculated using a modified version of the Bluelink Ocean Data Assimilation System (BODAS; Oke et al. 2008).



Correlations with the zonal surface velocity from OSCAR data

Predicting the "flavour" of El Niño

Cold tongue and warm pool El Niños



Although there is predictive skill for important indices of El Nino (see Table), the difference between the two *patterns* of El Nino is only maintained out to about 3 months lead time. The patterns become increasingly indistinguishable at longer leads. This is postulated to stem from spurious westward displacement of the maximum SSTA in cold tongue events, attributed to the drift of POAMA's cold tongue El Niño mode (Hendon et al 2009).

Correlation (3-month mean SST indices, all start months, 1980-2006)

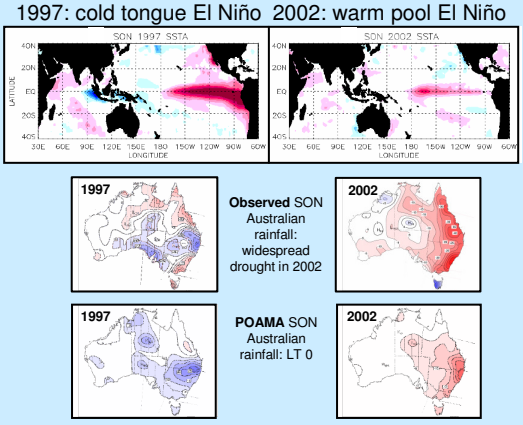
	1 month lead	3 month lead	5 month lead
NINO3 (Cold tongue El Niño)	0.87	0.77	0.68
EMI: El Nino Modoki index (Warm pool El Niño)	0.83	0.73	0.70

Relation to Australian rainfall

Australian rainfall is sensitive to the "flavour" of El Niño. Below average rainfall is more closely related to warm pool El Niño events than cold tongue events (Wang and Hendon 2007). The teleconnection between the leading EOFs of SST and Australian rainfall is well depicted by POAMA, and spring-time rainfall over eastern Australia and major drought events are predictable up to a season in advance (Lim et al 2009).

Case study

1997: cold tongue El Niño 2002: warm pool El Niño



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