

Perturbed Physics Ensemble Results

May/Nov 1991 – 2001 Start Dates

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Experiments

9 member PPE Ensemble runs for years 1991-2001 with May and November start dates (i.e., 22-ten year long runs)

Members were selected to represent a range of climate sensitivity and ENSO variability based on the free running QUMP (HadCM3) expts.

Assimilation

Anomaly Assimilation: 6-hourly pstar, theta, u and v for atmosphere [ERA40]

Monthly Temperature and Salinity for Ocean [Smith et al. (2006)]

44-year climatology for atmosphere

46-year climatology for ocean

Forecast Anomalies

Produced by **removing** corresponding model climatology used for assimilation

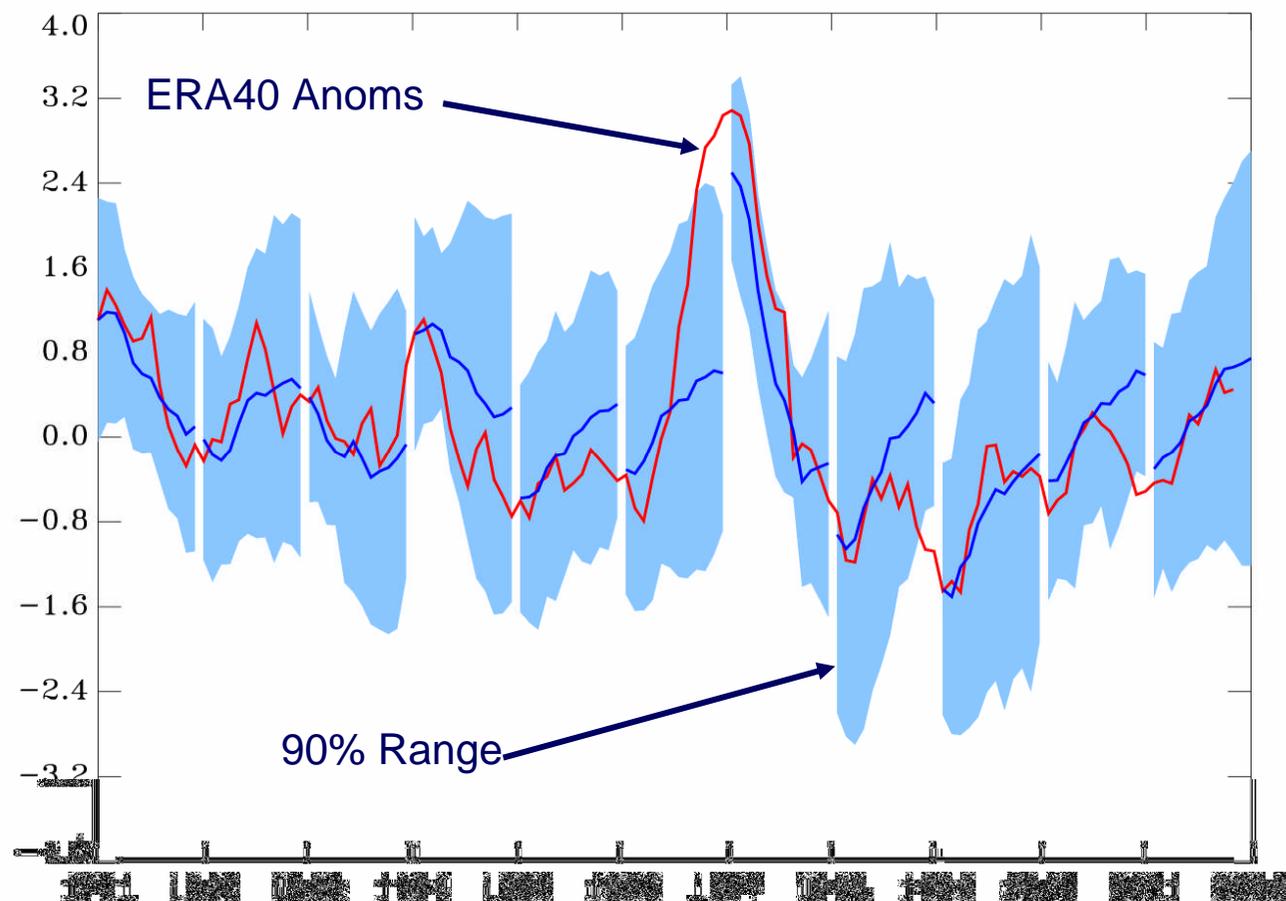
12 Month hindcasts for NINO3 T1.5M (Nov Start)



Nov Start 12 month Nino3 hindcasts

90% sigma range envelopes
Observed anomalies.

Note however that wider
the range higher the
uncertainty



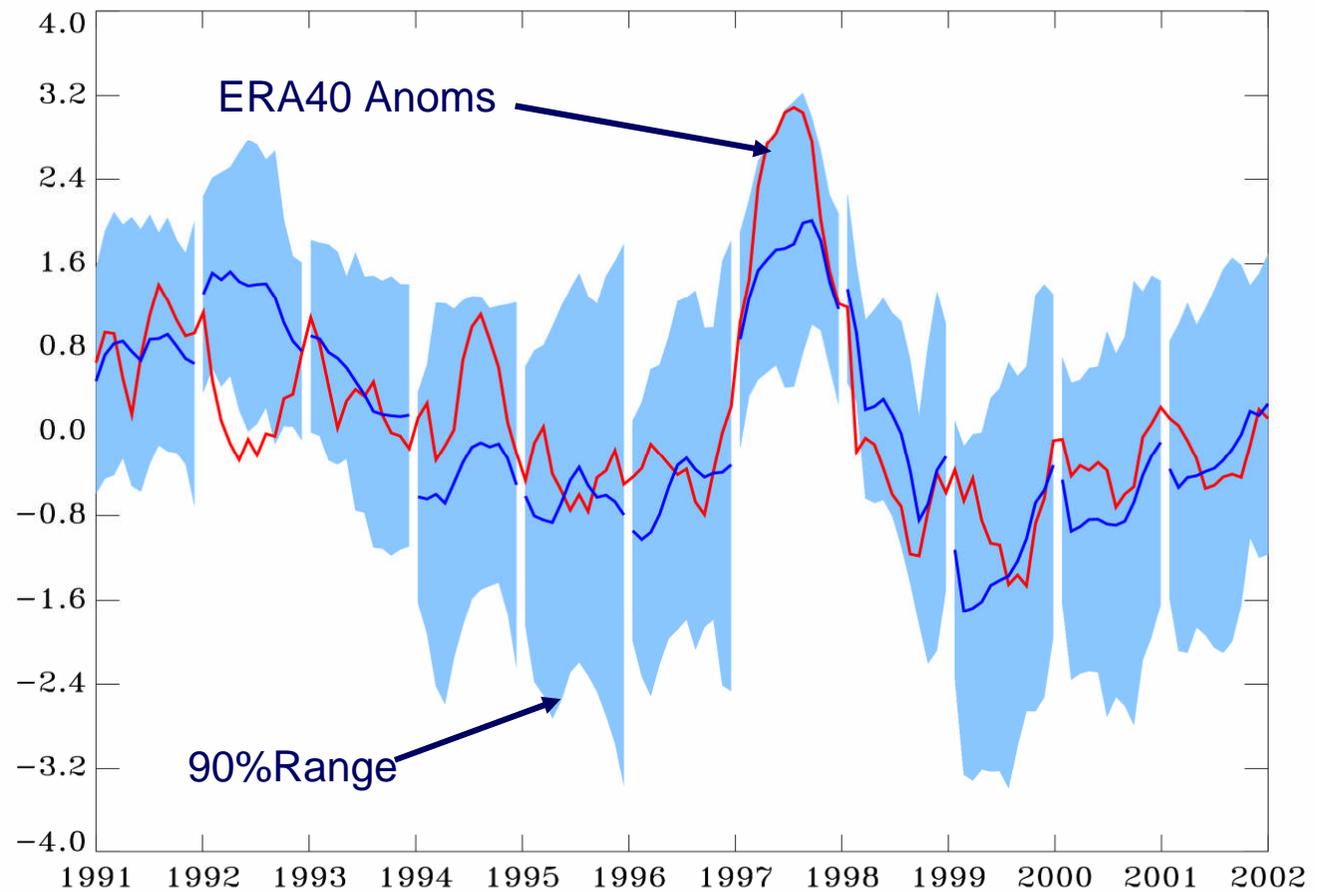
12 Month hindcasts for NINO3 T1.5M (May Start)



May Start 12 month Nino3 hindcasts

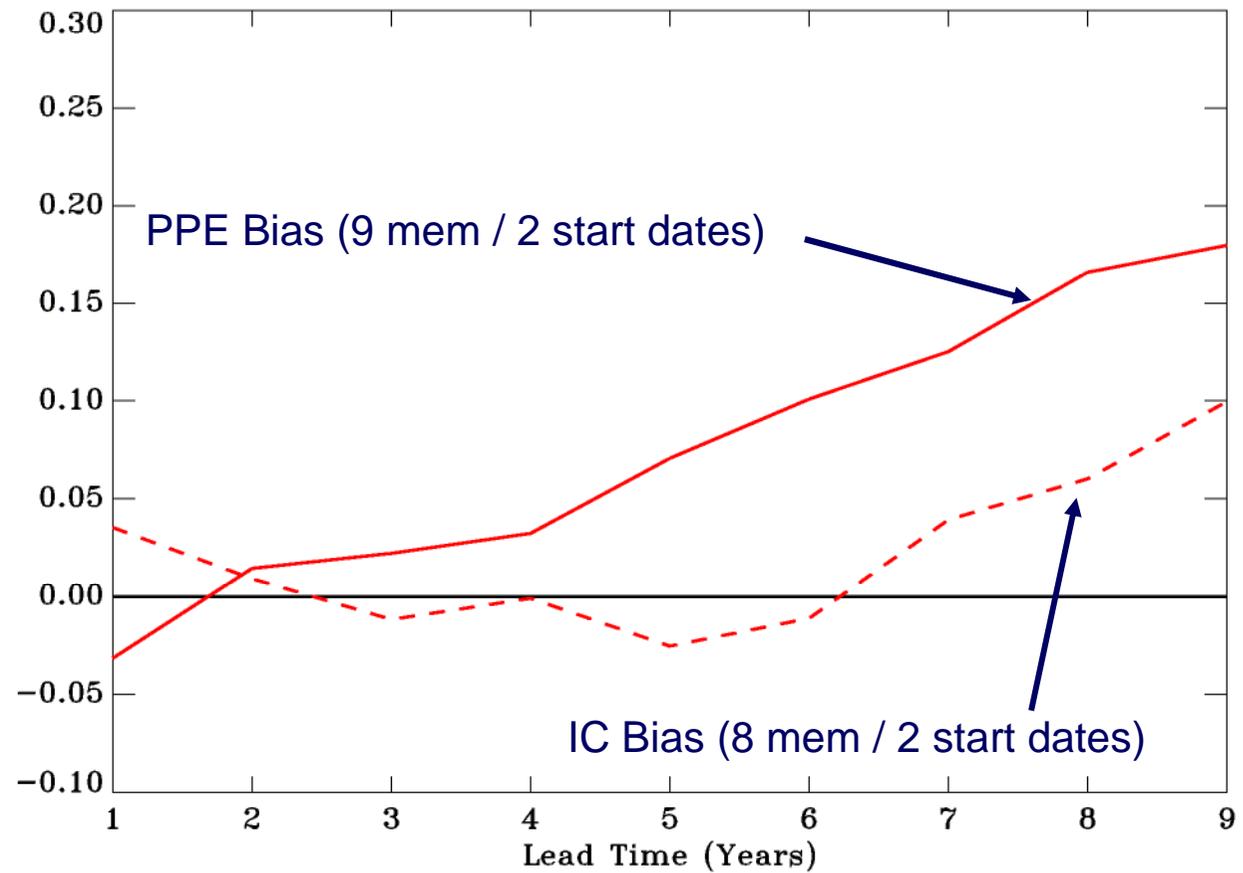
Ensemble Means are relatively less skilful for May start dates

Spring Barrier?



PPE and DePreSys bias (1991-2001)

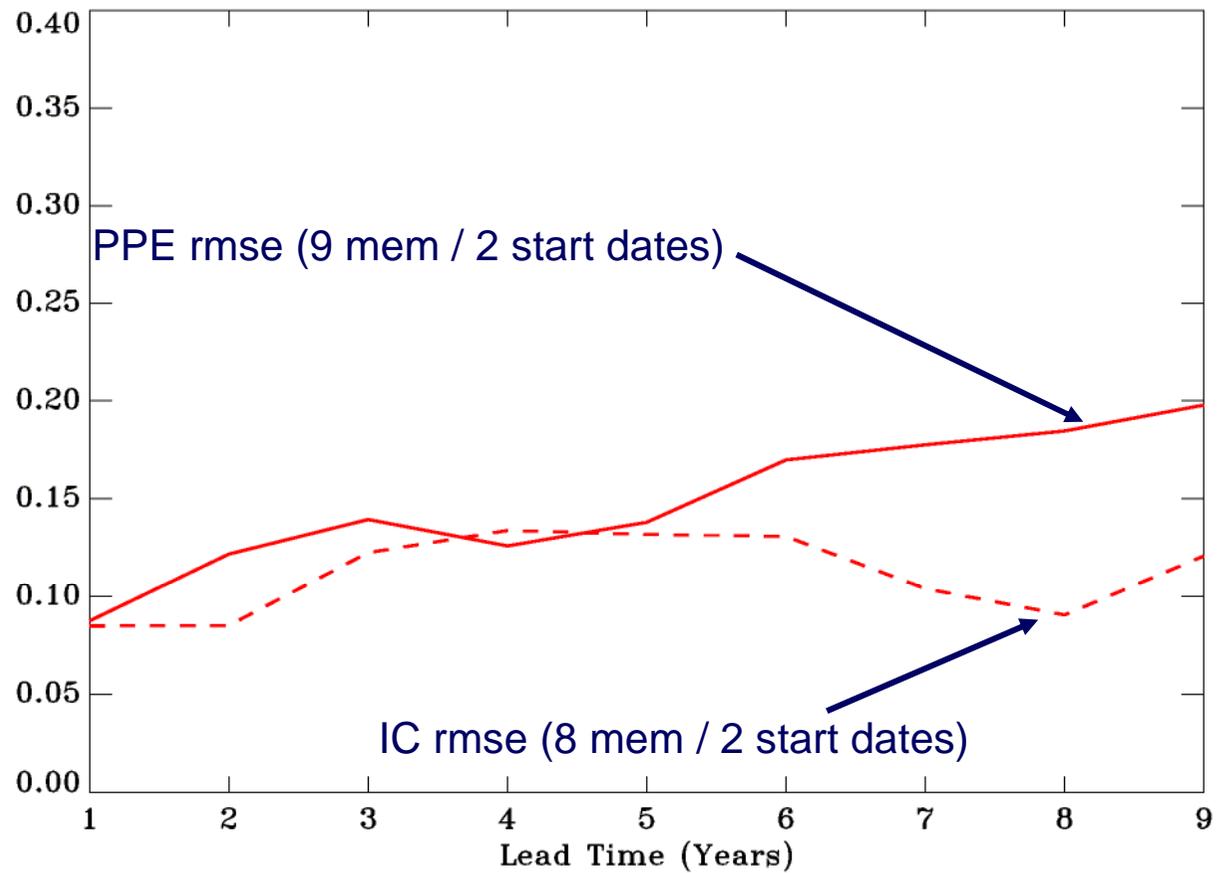
PPE – the average bias is positive in general, and increases at longer lead times





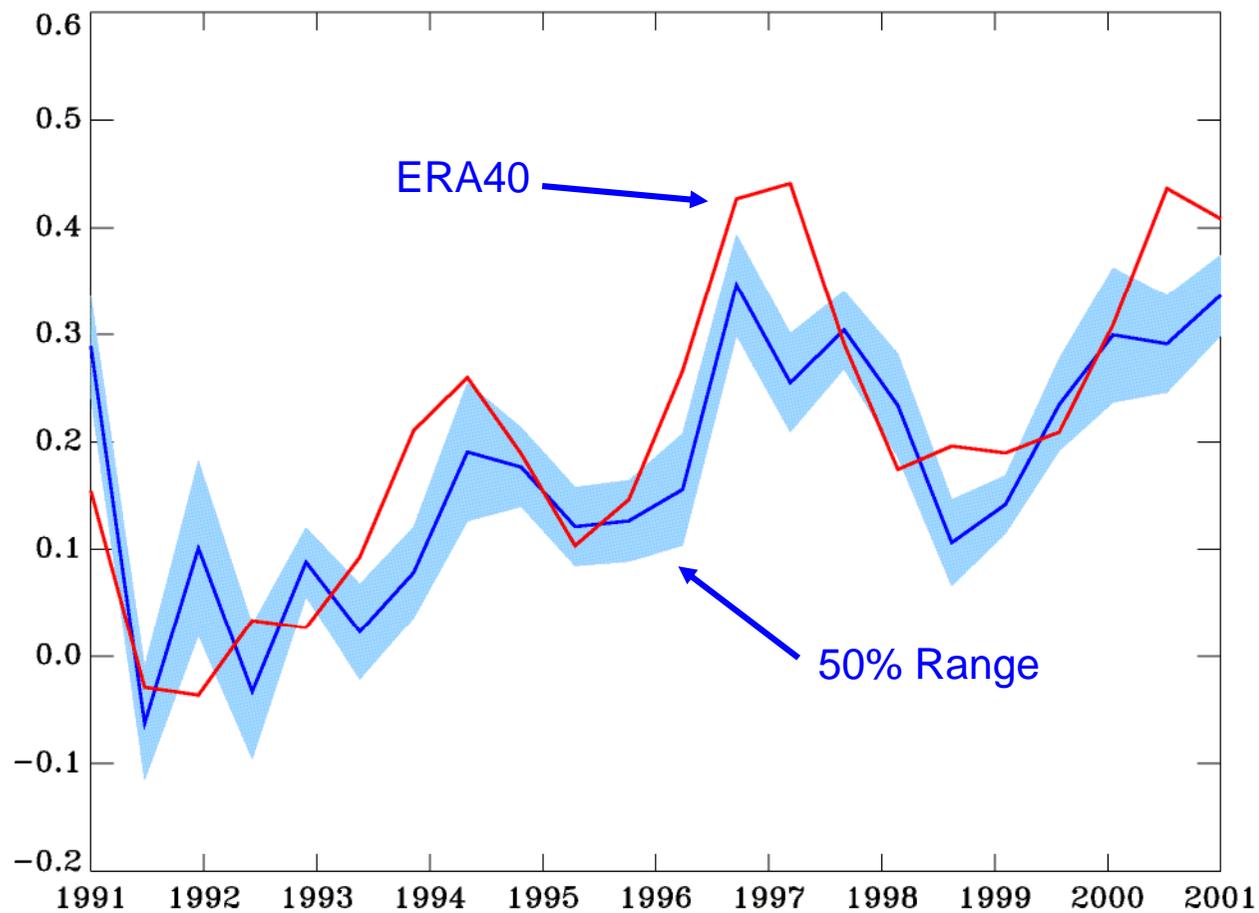
PPE and DePreSys RMSE (1991-2001)

Forecast skills comparable at shorter lead times with the old hindcast set. The positive bias shows up at the longer lead times.





First year forecast (22 start dates)

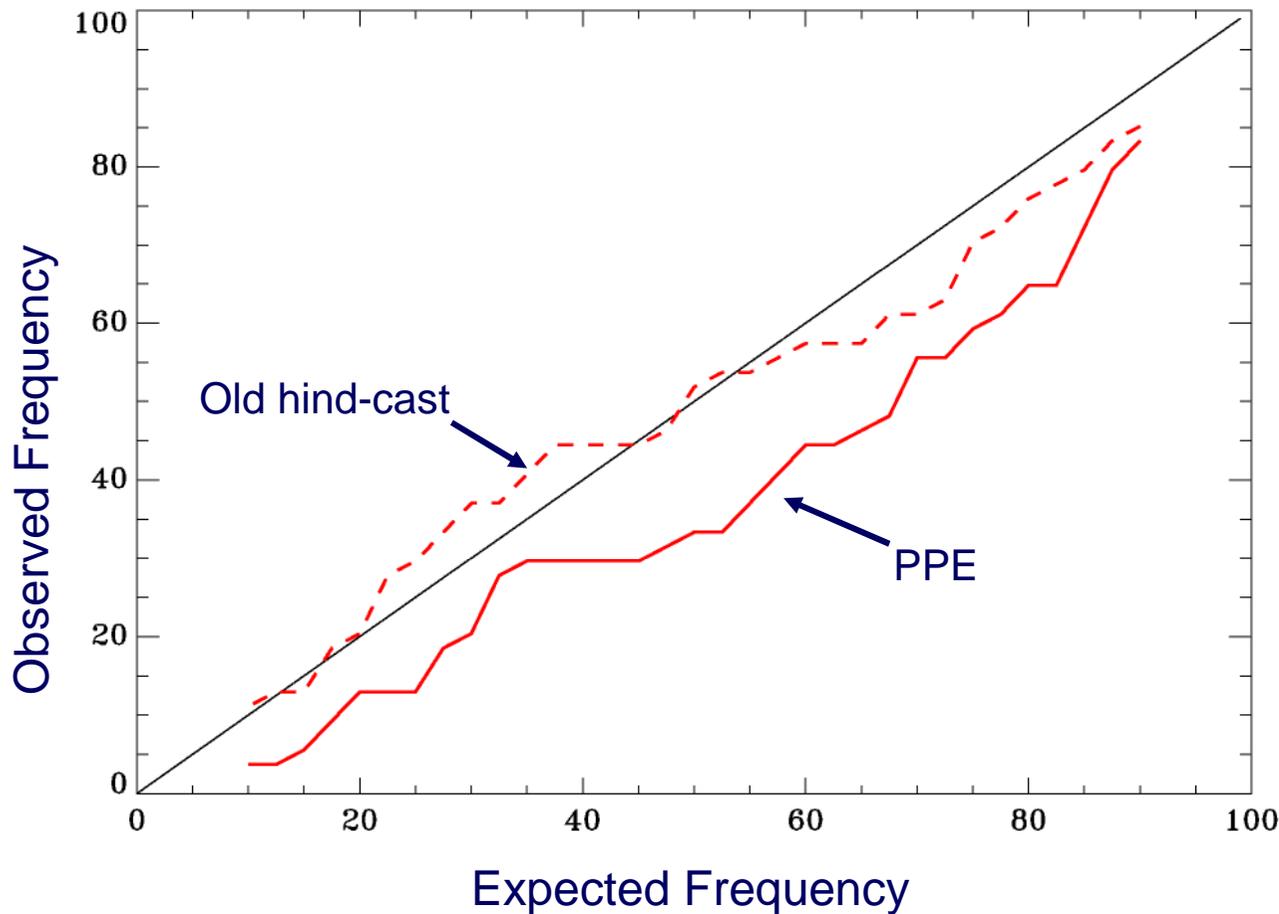


For example,

32% of the observed anomalies over the hind-cast period fall within the 50% expected frequency range of the forecast anomalies



Reliability Diagram 1.5mT



For any pre-assigned frequency the new PPE system captures the observed anomalies a fraction less.

The old hind-cast system appear to perform relatively better.

In Summary, the preliminary results shows that:

- 1) The new PPE prediction system appear to a positive bias, especially at the longer lead times, and that reflects in the rmse scores as well; and
- 2) The reliability estimates, even for the shorter lead times, are lower compared to the old DePreSys system

However note that the s2d PPE prediction system combines two extremely complex systems: QUMP and DePreSys.

The PPE members warm faster than their free-running QUMP counterparts during 1991-01.

A possible Source of Error:

Physics perturbation and flux adjustments may have introduced mismatch in assimilated ocean analyses.

Future Plans:

- 1) Understand the causes for the decreased skills in the new PPE system (Ocean assimilation, Flux adjustments).
- 2) Repeat 9-member PP Ensemble for May and Nov start dates for years 1991-2001.
- 3) Produce 9-member Initial condition ensemble using the standard DePreSys configuration.