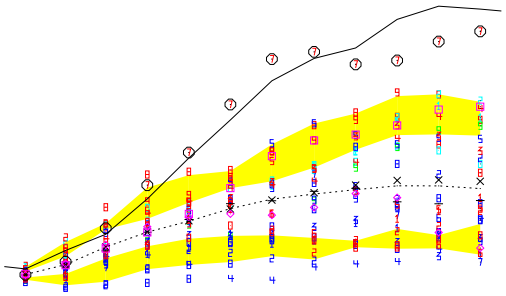
Assessing the Impact of Stochastic Forcing on ENSO Events



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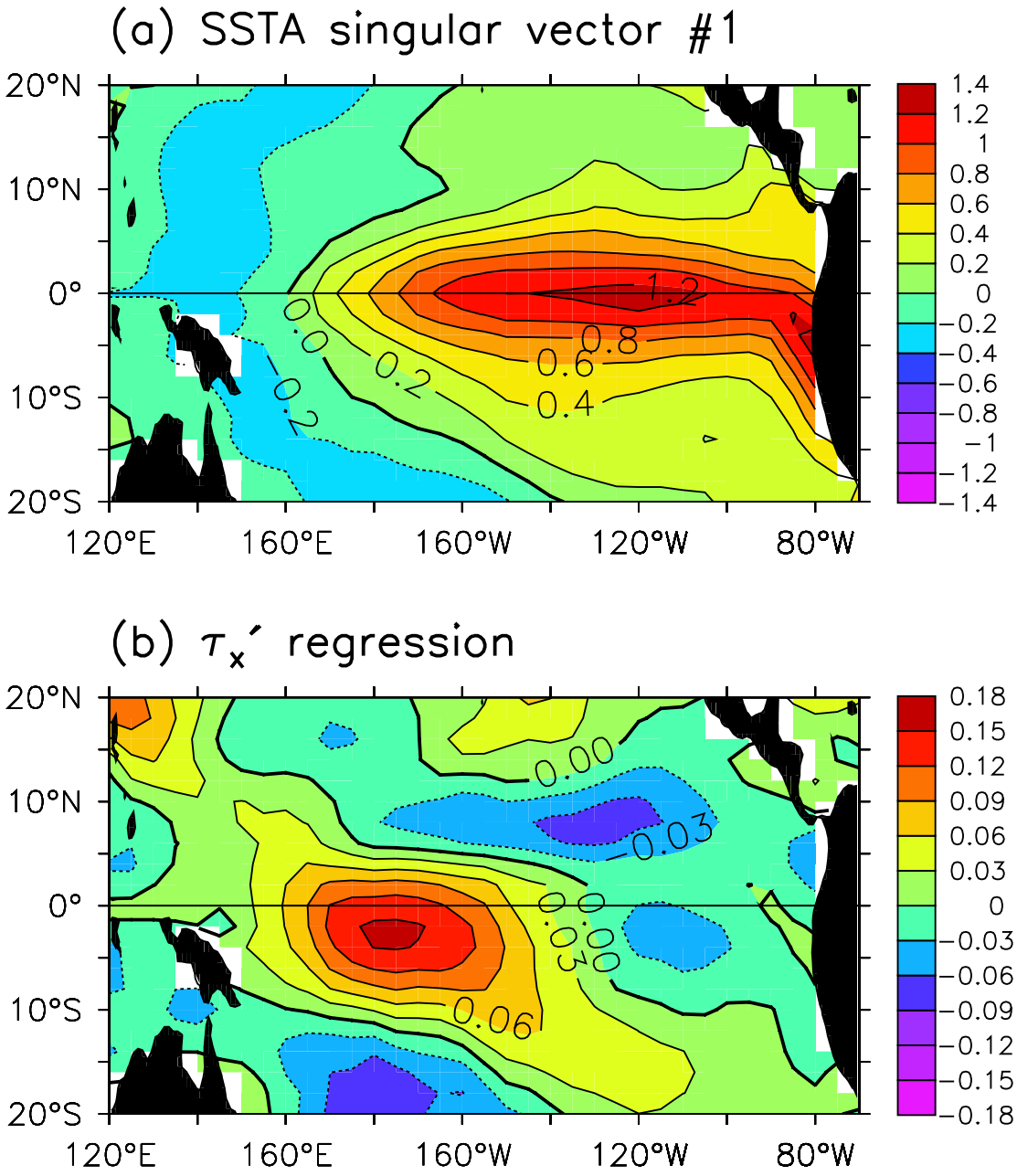
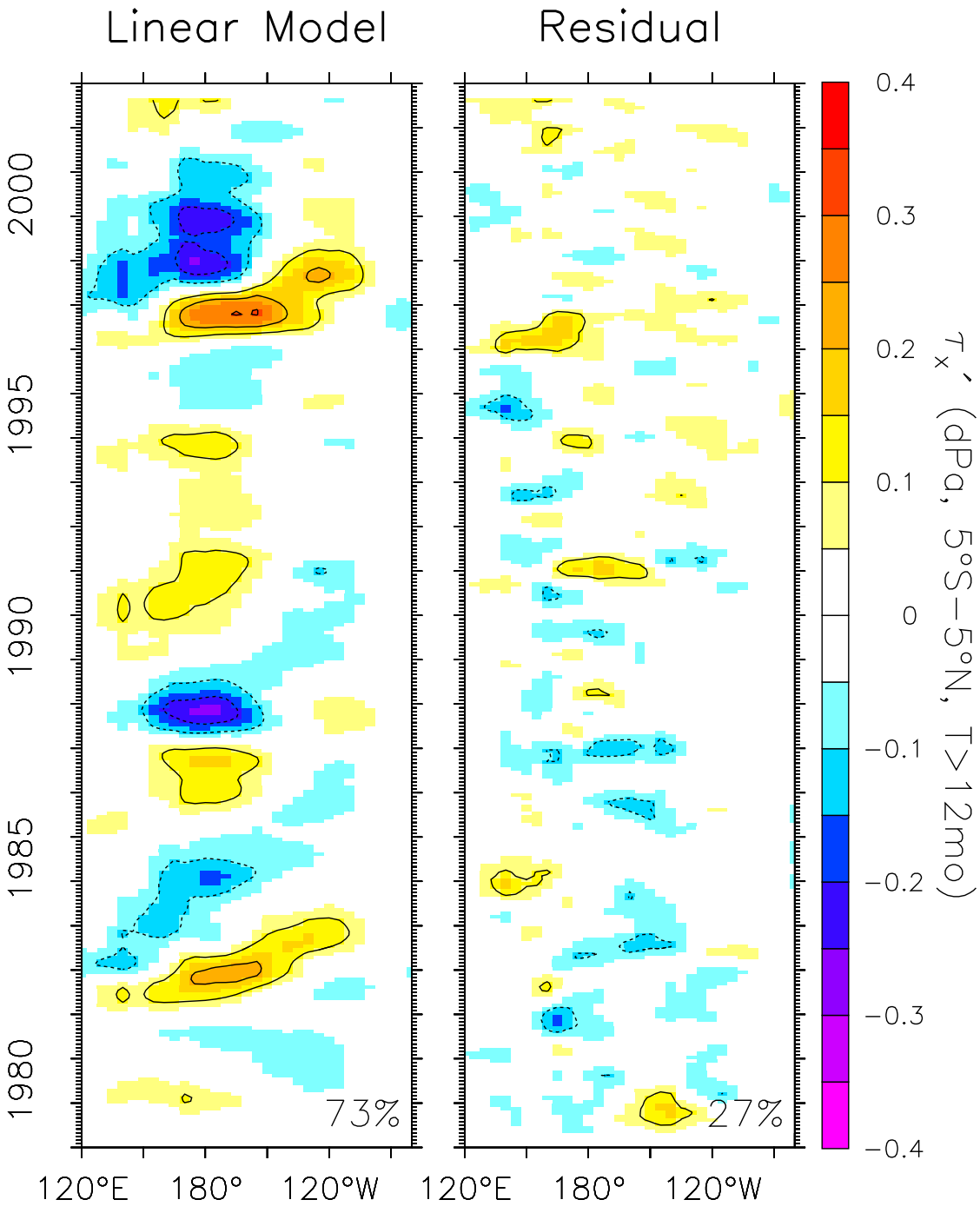
Statistical Atmosphere (Mode 1)

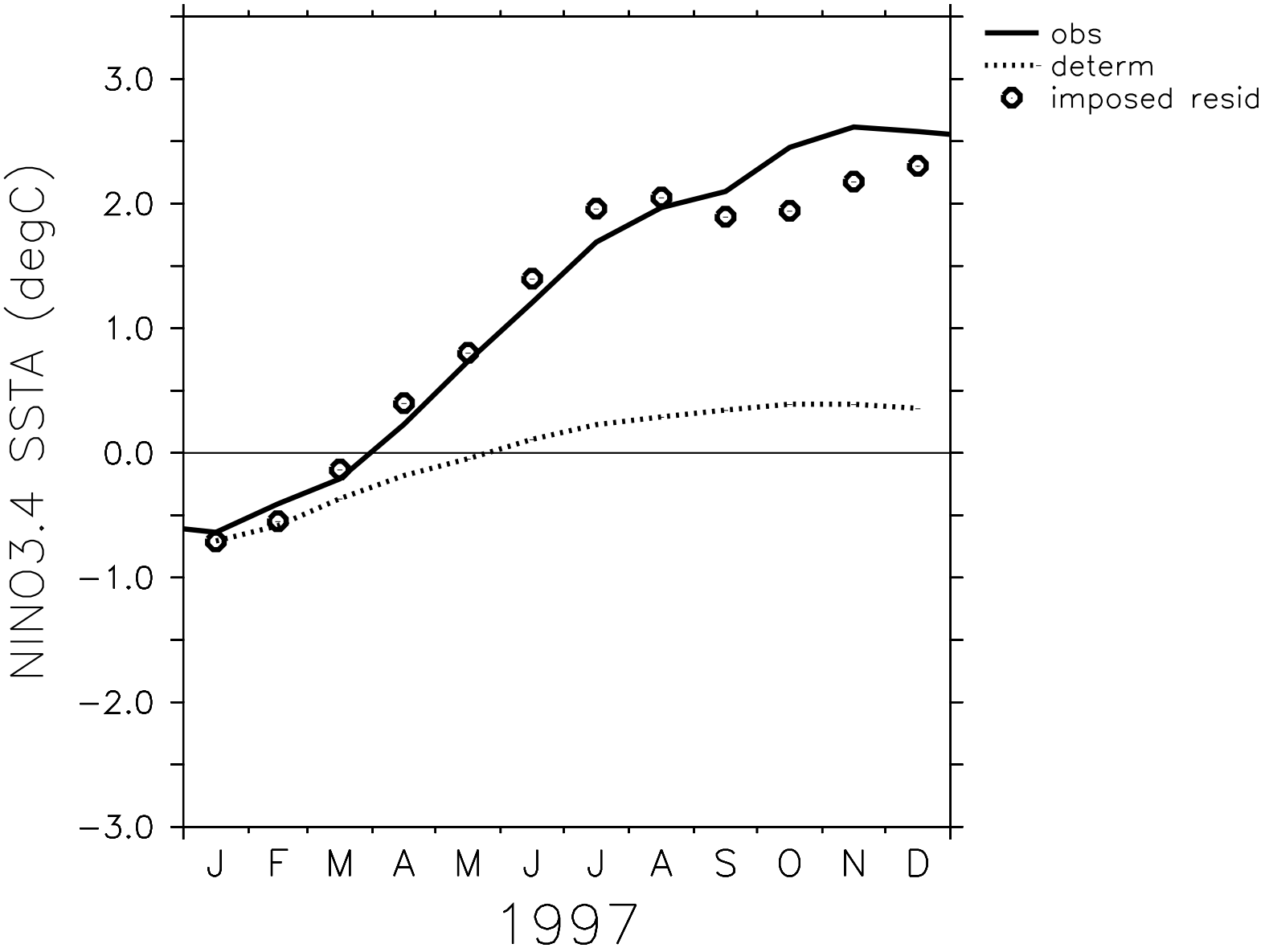
SST and wind stress from NCEP2 (1979–2002)



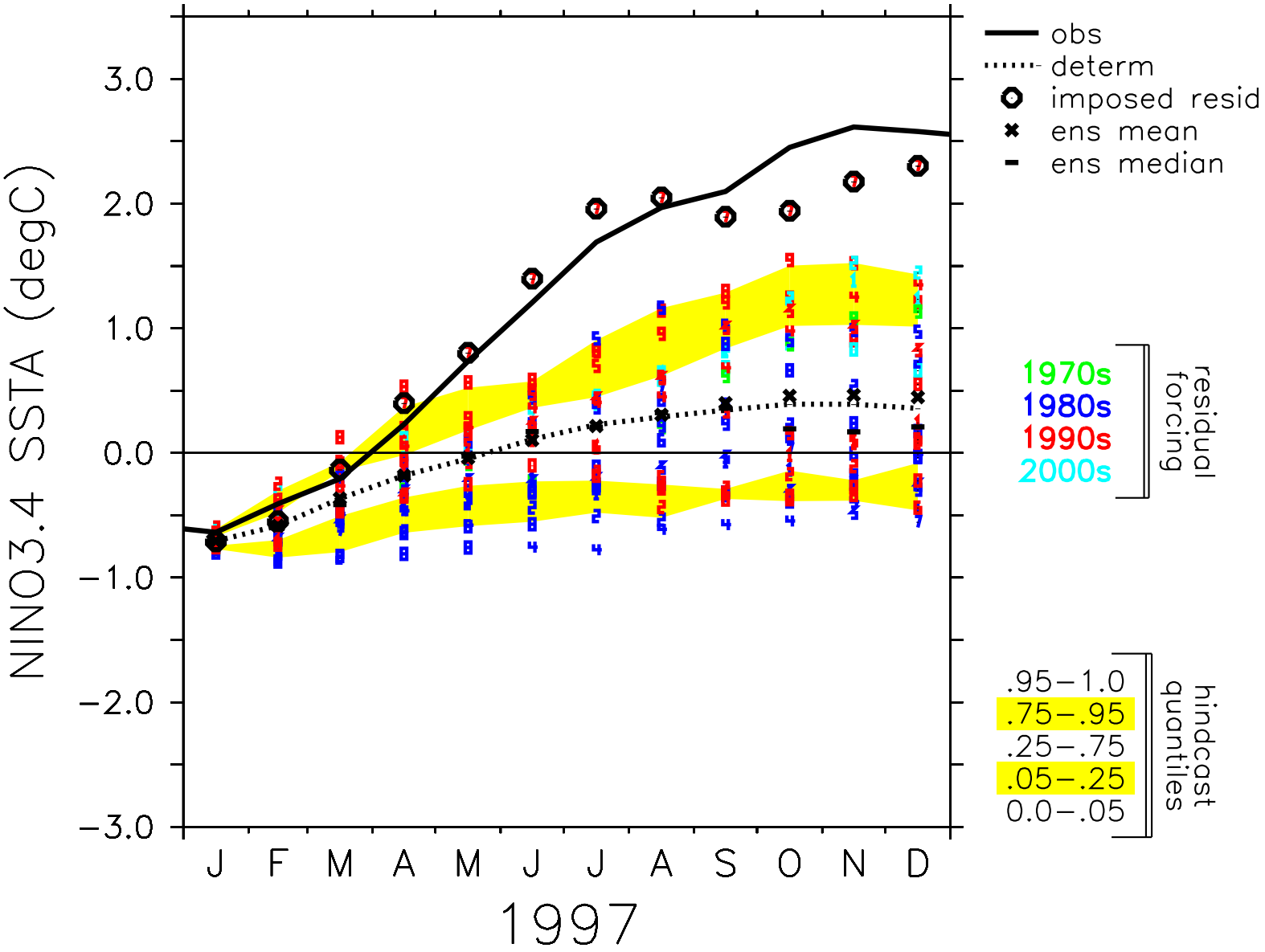
Wind Stress Decomposition: low-pass NCEP2 obs



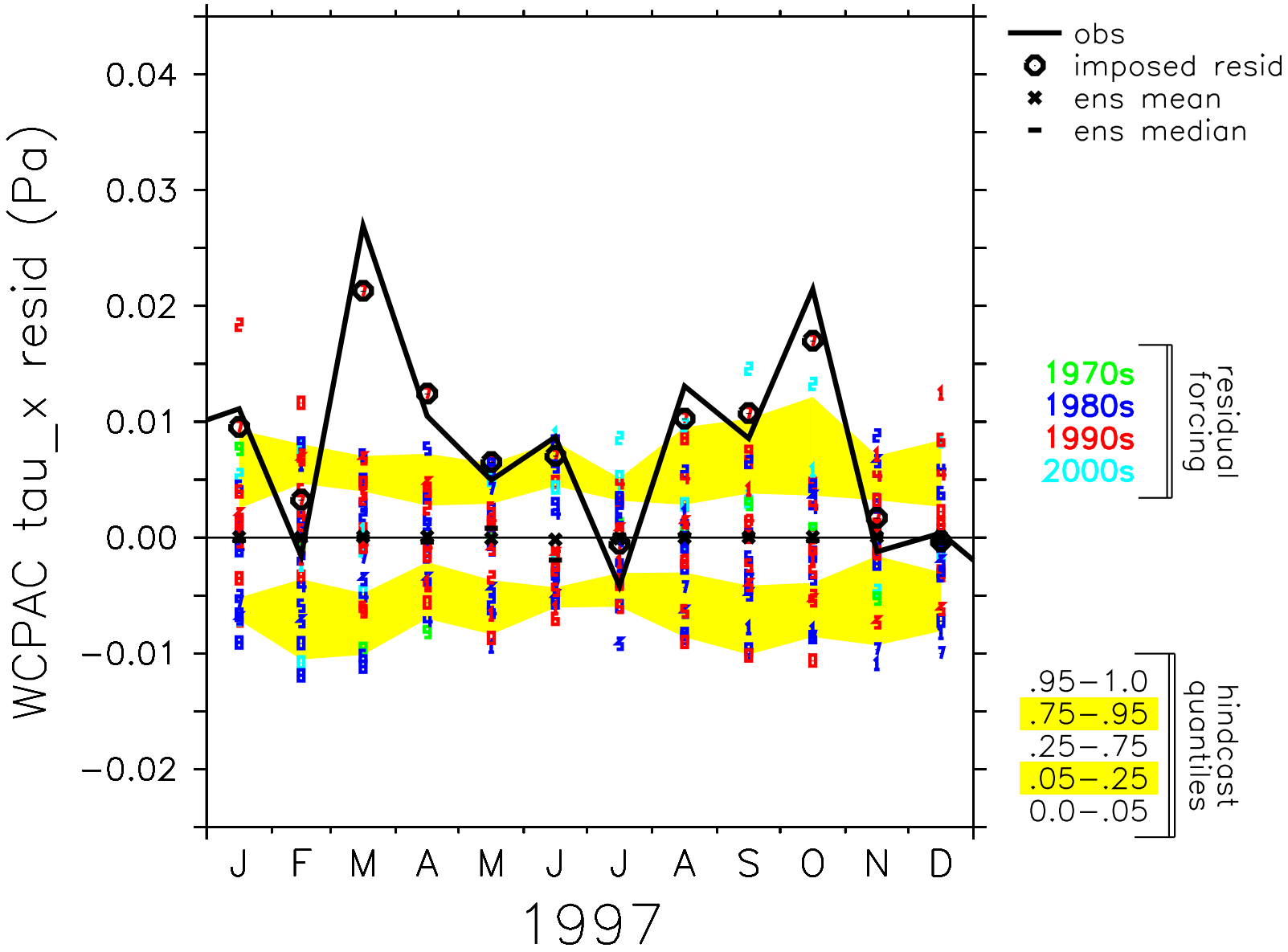
Deterministic Forecasts of East Pacific SST Anomalies



Stochastic Forecasts of East Pacific SST Anomalies

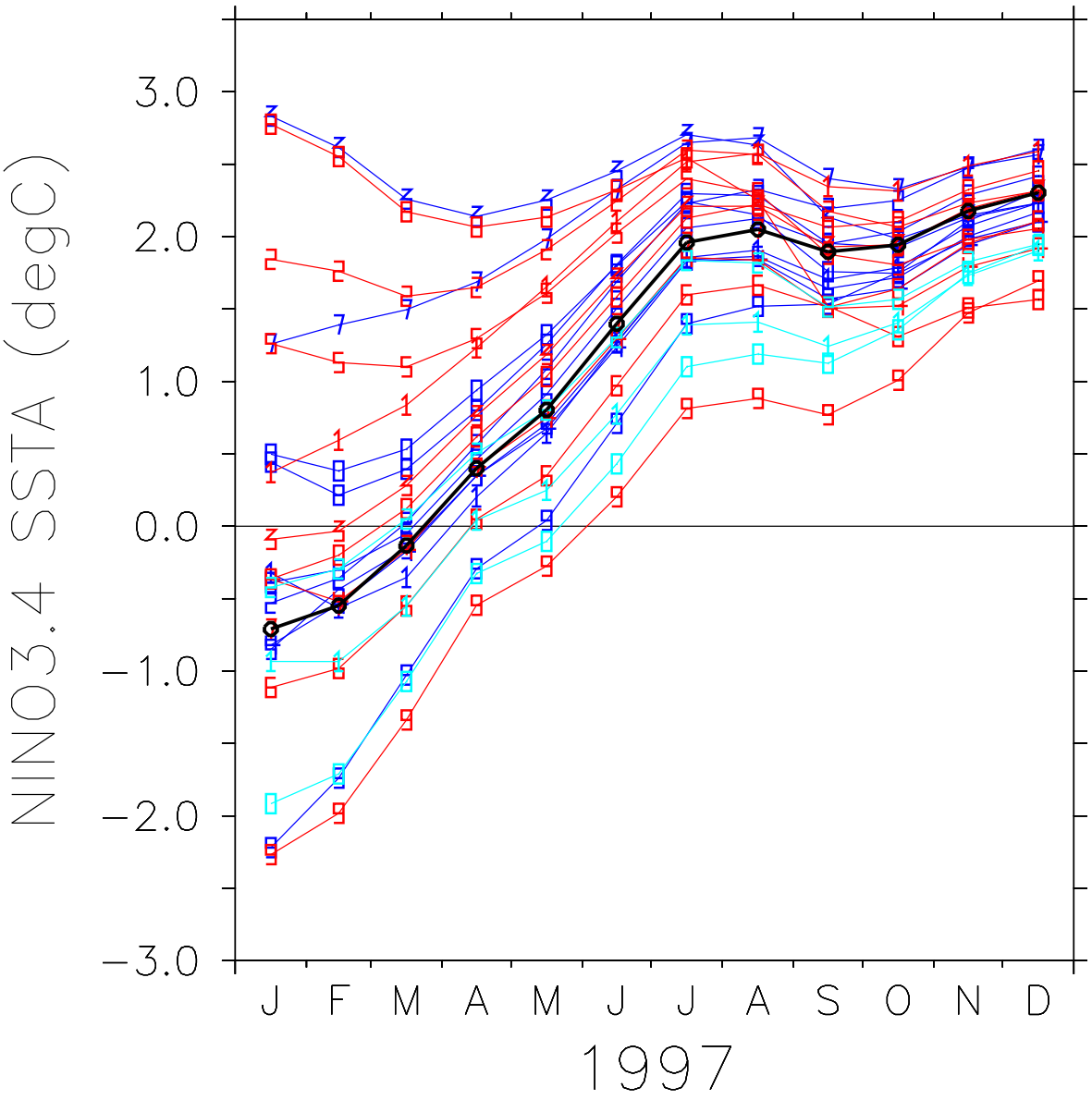


NCEP2 Residual Zonal Wind Stress

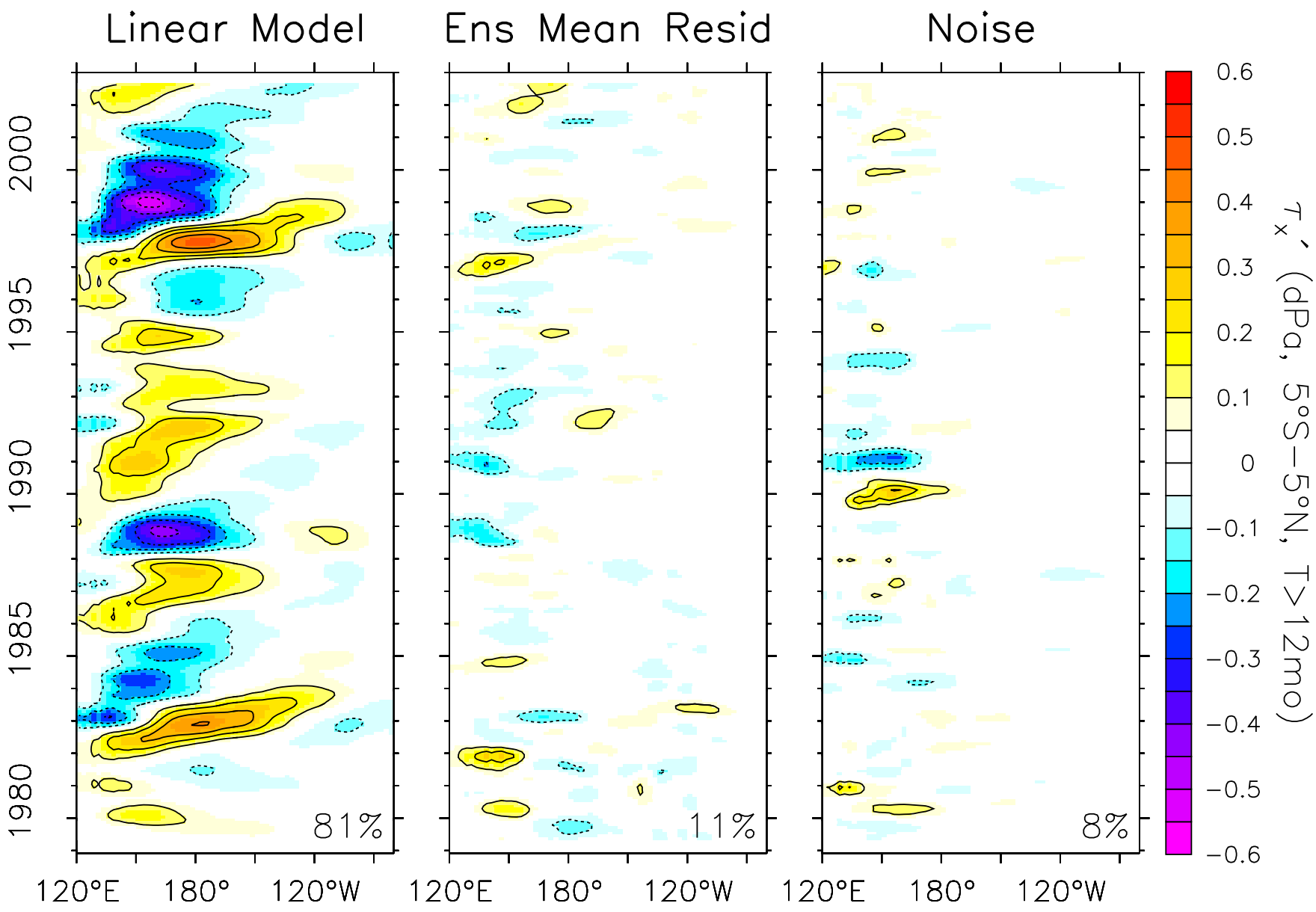


Random Initial Conditions

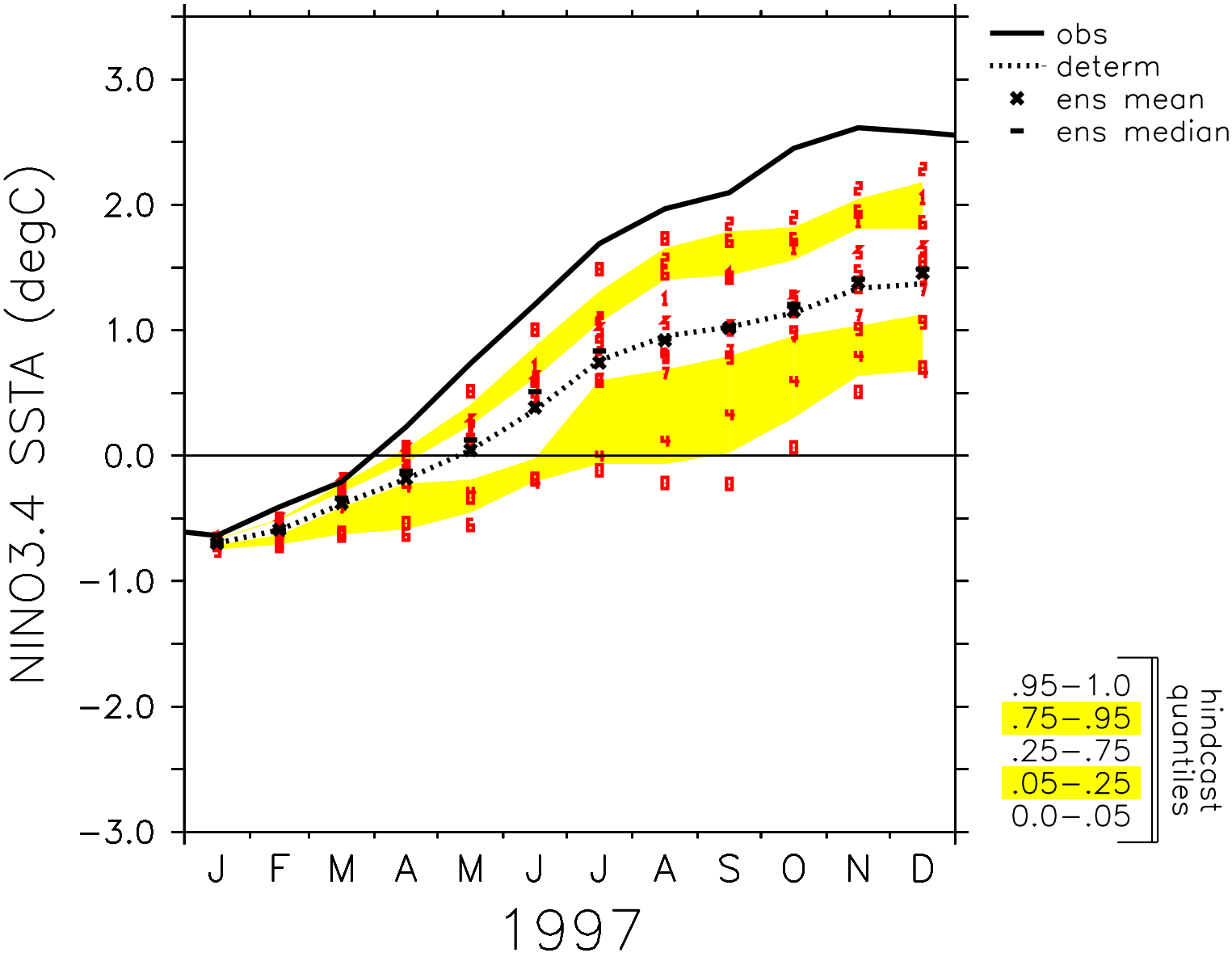
forced by 1997 stress residual



AGCM Wind Stress Decomposition: Low-Pass



“Cheatcasts” forced by AGCM stress residuals



Summary

1. Regression onto tropical Pacific SST captures most interannual variance of equatorial Pacific τ_x'.

2. But the residual stress matters. It induces strong dispersion of ENSO forecasts.

3. Pacific was preconditioned for warming in 1997. But unusually intense residual westerlies greatly amplified the warming.

4. The residual stress is not entirely random. Even the “noise part” has structure.