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Tracking energy budget anomalies through the ENSO cycle

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Mayer et al (2012) carried out comprehensive quantitative diagnostics of atmospheric energy budgets employing third generation reanalyses (ERA-I, MERRA, CFSR). They described robust anomaly patterns in zonally resolved fields such as the divergence of total, dry-static and latent energy transports as response to ENSO.
Numerous reanalyses of the ocean have become available in recent years, allowing for the investigation of interannual variations of ocean heat content (OHC) and the divergence of ocean heat transport (DIVFO, computed as residual from OHC tendencies and surface fluxes) in a similar manner as in the study cited above. Uncertainty of DIVFO anomalies is estimated from the spread of all possible permutations of OHC tendencies and surface fluxes. Hence, it is now possible to fully track energy anomalies through the ocean-atmosphere-system employing global reanalysis data within a reasonable uncertainty range.
The results obtained from reanalyses provide a basis for exploration of the variability of tropical atmospheric and oceanic energy budgets in climate model runs from the CMIP5 (Coupled Model Intercomparison Project 5) archive. While recent studies have addressed fields such as ENSO-related SST or wind stress anomaly patterns shown by the CMIP5 models, we compare patterns of anomalous energy transports from models (coupled historical runs) to those from reanalyses. It is shown that the response especially of the oceanic heat budgets in coupled models differs quite substantially when compared to the results obtained from reanalyses.

References:
Mayer, M., Trenberth, K.E., Haimberger, L. and Fasullo, J.T. 2012: Zonal Structure of Tropical Atmospheric Energy Budgets and their Response to ENSO. J. Climate, in press.