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Evaluating the global atmospheric response to ENSO Sea Surface Temperature forcing as simulated by the Global Environmental Mutli-scale Model (GEM).

J. Mainville (1), C. G. Jones (1) and B. Dugas (2)

(1) Université du Québec at Montréal (UQAM) Canada Regional Climate Modelling and Diagnostics (CRCMD), (2) Environnement Canada (EC) Recherche en Prévision Numérique (RPN), Montréal, Canada (mainvill@sca.uqam.ca)

In this work we evaluate the variability of deep convection and associated atmospheric teleconnections to ENSO sea surface temperature (SST) forcing, using the Global Environmental Multi-scale model (GEM, Cote etal 1998). GEM was run at a resolution of 1˚ by 1˚for the period 1978-2001, using prescribed SSTs and sea-ice values following the AMIP2 specifications. We present results detailing the response of GEM to canonical ENSO forcing, defined using a Nino 3.4 SST index, and consider both the geographical location and timing (temporal delay) of atmospheric anomaly patterns in response to this ENSO variability. Both the simulated climatological ENSO response is analysed (i.e the atmospheric response meaned separately across all positive and negative phases of ENSO) as well as the interannual variability of the simulated response, across the global tropics, to varying ENSO forcing as encompassed within the period 1978-2001.

A preliminary analysis of central tendencies and statistical variability is performed using frequency histograms. The diagnostic errors, due to skewed probability density functions (pdf) are corrected with respect to the statistical mode. Higher time-frequency, propagating signals, associated with the ENSO cycle, are analysed using Hovmoller diagrams. While the interannual anomaly signal is diagnosed with respect to the seasonal mean of the analysed period. This signal is qualified with a multivariant diagram comparing the composites of 5 ENSO episodes. Instead of the standard interannual anomaly treatment we utilise a new ENSO anomaly, defined with respect to individual annual cycle variability. This definition results in more robust

and self-same ENSO composites.

Relationships between the ENSO reference forcing and affected atmospheric variables is studied with a phase diagram (attractor). Temporal correlation coefficients and the Student-t-test quantify regions and delays that are statistical significant.