

ENSO simulation in GCMs: A review and recent progress

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Changes in the activity of the El Nino-Southern Oscillation (ENSO) phenomenon under global warming could potentially have a large impact on the global weather, society, and economy, but have not so far been converged in ensembles of future scenario experiments based on multiple climate models. Using parameter ensembles of four high-end climate models with smaller errors in simulating ENSO in the present climate, we demonstrate that the ENSO will become more energetic under global warming. This occurs because the mean atmospheric state in a warmed climate is wetter over the central-eastern equatorial Pacific. The wetter mean state favours an eastward shift in the equatorial zonal wind stress response to El Nino/La Nina, which acts to increase the ENSO amplitude due to enhanced coupled instability. A careful analysis of the previous multi-model ensemble suggests a similar mechanism at work and indicates that the precipitation increase over the cold tongue region, relative to the change over the entire equatorial Pacific, is the key factor for the robust intensification of ENSO. A preliminary analysis to the CMIP5 archive, however, does not necessarily support the above conclusions.

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