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ENSO sensitivity to changes in the mean background state as simulated by a hybrid coupled GCM

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The characteristic behaviour of ENSO depends crucially on the mean climatic background state in the tropical Pacific. The question whether modifications of the mean state, e.g. due to greenhouse warming or tropical-extratropical interactions, affect ENSO variability is investigated with a hybrid coupled GCM (HCM) of the tropical Pacific basin. The HCM combines the advantages of a full physics ocean GCM, coupled with a computationally efficient but reasonable statistical atmosphere. The setup allows to prescribe climatic variations through changes in the magnitude of the mean wind stress and the coupling parameter between SST and wind stress anomalies. Various coupled runs are carried out to give an overview of possible ENSO variability changes in terms of amplitude and frequency, as well as changes in the mean SST and thermal structure. Generally the zonal SST gradient (zonal mean thermocline depth) gets stronger (deeper) if the mean wind stress is increased. This leads to an increase in ENSO frequency, while the amplitude is less affected. Vice versa, the amplitude of ENSO is more sensitive to the anomaly coupling, while the frequency is relatively unaffected. The results are compared to earlier studies with intermediate complexity models as well as to coupled AOGCM studies.