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Twentieth century ENSO characteristics in the IPCC database

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The El Niño-Southern Oscillation (ENSO) variability is explored from a large set of climate model experiments.

We perform a multi-model and multi-index analysis of the sea surface temperature along the equatorial Pacific based on the use of a non-linear neural classification algorithm, the Self-Organising Maps (SOMs). This method allows a detailed description of ENSO spatial characteristics, separating El Niño from La Niña events. We applied it to 23 hundred-yrs model simulations of the twentieth century (20c3m) from the IPCC-AR4 database and a hundred-yrs observed data set (HadISST).

Systematic biases include a larger than observed proportion for modelled ENSO maximum variability to occur in the Western Pacific. This western bias is strongly related to a misrepresentation of both El Niño and La Niña termination phases for most of the models. Indeed, in this analysis, we qualify how a model is able to simulate each observed event phase (onset, peak, and termination). A striking result is a dissymmetrical bias between modelled El Niño and La Niña peaks. Whereas the main El Niño peak bias is to exhibit higher than observed western peaks, simulated La Niña main bias occurs in the Central Pacific. Moreover, it appears that models simulating realistic conditions differ from one phase to another. In addition, there is no clear relationship between the ENSO variability biases and the characteristics of the modelled mean state bias in the equatorial Pacific.