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Tropical Pacific - North Pacific teleconnection in a coupled GCM: Is ENSO a crucial player?

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The connection between Tropical Pacific and North Pacific variability is investigated in a state of the art coupled ocean-atmosphere model, comparing two twentieth century simulations at T30 and T106 atmospheric horizontal resolutions. Despite a better simulation of the frequency and the spatial distribution of the Tropical Pacific anomalies associated with the El Nino Southern Oscillation (ENSO) in the T106 experiment, the response in the North Pacific is scarcely different from the T30 experiment, where the ENSO variability is weaker and more frequent than observed. In both experiments, the weakness of the atmospheric teleconnection in the North Pacific can be related with the weaker than observed precipitation anomalies simulated in the tropical Pacific that act as a less effective vorticity source. The teleconnection as a response to the Rossby waves originating from the tropics appears to be affected by local coupling processes, likely induced by different atmospheric resolutions. The coupling occurring between sea level pressure (SLP) and SST in the North Pacific, as well as the influence of the Tropical Pacific SST, is measured by means of the "coupled manifold" statistical technique. In the high-resolution experiment, the fraction of the SLP variances linked with the North Pacific SST "free" from the Tropics is comparable to the fraction due to the tropical Pacific SST. On the other hand, in the low-resolution case the SLP variances linked with the "free" North Pacific SST are weak and the regions where the coupling is stronger are somehow driven by the tropics, consistently with the observations. The results show that increasing the atmospheric horizontal resolution does not reduce the coupled model systematic errors in the representation of the teleconnection between the North and the Tropical Pacific. This suggests that the validation of coupled models have to consider separately remote and local processes.