



The impact of doubled CO₂ on winter ENSO teleconnections

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The impact of doubled CO₂ concentration on the winter ENSO teleconnections is studied using the two 20-member ensembles made by an atmospheric general circulation model of intermediate complexity with a particular interest on the model response over the North Atlantic/European (NAE) region. Initial conditions of model runs differ among ensemble members in the definition of tropical diabatic heating. Current climate experiment is based on numerical simulations forced with observed sea surface temperatures (SST) for the 1855 – 2002 period. Warmer climate corresponding with doubled CO₂ levels is simulated by a modification in the radiation parameterisation and SST forcing which is represented by the same SST anomalies as in current climate experiment superimposed on the climatological SST that was taken from a complex atmosphere-ocean general circulation model forced with doubled CO₂. SST anomalies in the Niño3.4 region, categorised into five classes, enabled a composite analysis of changes in the Northern Hemisphere tropical/extratropical teleconnections. As the climate warms, changes in the both tropical and midlatitude atmospheric circulation are found. The main features of the tropical-extratropical teleconnections are maintained in both experiments; for example, irrespective of the sign of SST anomalies, the amplitude of the atmospheric response is positively correlated with the intensity of ENSO event and the El Niño impact is stronger than that of La Niña of the same intensity. The strongest extratropical signal is found over the Pacific/North American (PNA) region, however, the ENSO impact on the PNA is reduced in a warmer climate relative to the current climate. Over the NAE region a positive climate trend in ENSO teleconnections is found. Although the ENSO signal is much weaker over the NAE than over the PNA region, it is significantly strengthened in the experiment with the doubled CO₂ concentration. Such an atmospheric response in a warmer climate is found to be associated with changes in the mean state followed as well as in the jet waveguiding effect and stationary wave activity.