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Changes in the wintertime ENSO teleconnection over the Northern Hemisphere in a warmer background state

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The sensitivity of wintertime ENSO teleconnection to a warmer mean climate is investigated by contrasting two ensemble numerical experiments of the CNRM-CM5 model: one representing pre-industrial mean conditions and one corresponding to the late 21st century climate under RCP8.5 scenario. The ensemble experiments are designed such that they share the exact same ENSO events but simply differ by their climatological background. Technically speaking, a period of 30 years representative of ENSO variability in CNRM-CM5 is a priori selected from the 850-year pre-industrial control run of the model. Pacemaker ensemble experiments are then conducted through restoring of the model SST in the Eastern Pacific Tropical band towards the anomalous selected SST on top of either pre-industrial or RCP8.5 mean state, assessed from long control integrations. Two 30-year long ensembles of 10 members are thus performed. By construction, this protocol allows us to clearly isolate the role of the warmer background state in the modification of teleconnection in response to unchanged ENSO variability.

Over the North Pacific, our results confirm the eastward shift of the ENSO-induced Aleutian deepening in a warmer climate. The latter is explained by the tropical shift of the diabatic heating anomalies in response to ENSO events. Over the North Atlantic, a considerable reinforcement of the ENSO teleconnection is found and projects upon the NAO. The ENSO-NAO linkage is almost in-existent in pre-industrial climate albeit episodic during El Niño events leading to NAO-. The establishment of ENSO-NAO linkage in a warmer climate is mainly due to NAO+ excitation during La Niña events as revealed through a weather regime approach. This emphasises the importance of the asymmetry/nonlinearity of the ENSO-Atlantic connection in CNRM-CM5. The establishment of the teleconnection in a warmer world is explained by the stronger, southward-shifted and eastward-elongated North Pacific jet that connects with the North Atlantic jet, thus favouring the hemispheric propagation of synoptic storms from the Pacific to the Atlantic. Eddy mean-flow interaction is partly responsible for the NAO excitation. To go further, we investigate the changes in mean and extreme precipitation and temperature over Europe in response to the reinforced ENSO-Atlantic teleconnection.