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The role of an Indian Ocean heating dipole in the ENSO teleconnection to the North Atlantic in early winter in the 20th century in observations and CMIP5 simulations

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In this study the role of an Indian Ocean heating dipole anomaly in the transition of the North Atlantic circulation response to ENSO from early to late winter is analysed using 20th century observations and simulations from the fifth Coupled Model Intercomparison Project (CMIP5). It is shown that in early winter a warm (cold) ENSO even is connected trough an atmospheric bridge with positive (negative) rainfall anomalies in the western and negative (positive) anomalies in the eastern Indian Ocean. The early winter heating dipole teleconnected to a warm (cold) ENSO event can set up a wavetrain emanating from the south Asian subtropical jet region that reaches the North Atlantic and leads to response that spatially projects onto the positive (negative) phase of the North Atlantic Oscillation (NAO). The Indian Ocean heating dipole is partly forced as an atmospheric teleconnection by ENSO, but can also exist independently and is not related to local Indian Ocean SST forcing. The Indian Ocean heating dipole response to ENSO is much weaker in late winter (February and March) and not able to force significant signals in the North Atlantic region. CMIP5 models reproduce the early winter heating dipole reponse to ENSO and the ENSO response transition in the North Atlantic region to some extend, but with weaker amplitude. Generally models that have a strong early winter ENSO heating dipole teleconnection to the Indian Ocean also reproduce the North Atlantic response. If an Indian Ocean vertical velocity dipole index is defined, overall CMIP5 models are able to reproduce the extratropical responses in early winter reasonably well.