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Role of Indian Ocean heating anomalies in the early winter ENSO teleconnection to the South Asian and North Atlantic regions

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The role of the Indian Ocean heating anomalies in the ENSO teleconnection to South Asia and North Atlantic/European regions are investigated in the early winter season. Using re-analysis data, CMIP5 simulations and idealized numerical model experiments it is shown that the ENSO teleconnections in early winter in these regions are dominated by an ENSO-induced heating dipole in the Indian Ocean region. The Indian Ocean heating dipole leads to a Gill-type response in the South Asian region through Sverdrup balance. For a warm ENSO event, this response is a cyclonic upper-level anomaly that shifts the subtropical South Asian jet southward and increases precipitation in the that region. The cyclonic anomaly is the starting point of a stationary Rossby wavetrain that traverses the North Pacific and North American region and eventually reaches the North Atlantic. Here transient eddy feedbacks are likely to strengthen a response that spatially projects on the positive phase of the NAO and negative phase of the Atlantic ridge patterns. For cold ENSO events these anomalies are roughly opposite. The importance of the Indian Ocean heating dipole decreases towards late Winter due to a southward shift of the Indian Ocean rainfall climatology and a more dominant direct wavetrain from the central Pacific region.