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The seasonal teleconnections of the Indian Ocean Dipole to the North Atlantic region

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The Indian Ocean Dipole (IOD) is a major source of seasonal climate variability in the Indian Ocean. This dipole has strong impacts on the Indian Ocean region and through teleconnections can influence the seasonal climate of remote regions like the North Pacific and North Atlantic. A prominent example of this teleconnection from the IOD occurred in the winter 2019/2020, where the IOD was in a positive state. This influenced the state and predictability of the Northern Hemisphere extratropics. Thus, a good understanding of the mechanism that transports information from the Indian Ocean to the North Atlantic is desirable. In this contribution we investigate the special teleconnection of the winter 2019/2020 and analyse the transport mechanism.
In model experiments with the OpenIFS from ECMWF we show that the NAO in the winter 2019/2020 is influenced by the IOD and analyse the teleconnection mechanisms. We use hindcast ensemble model experiments of the DJF season 2019/2020 to analyse the behaviour of the IOD and its impact on the NAO. In the uncoupled OpenIFS the Sea Surface Temperature (SST) boundary conditions are perturbed in regions of importance to the NAO (like the ENSO region and the Indian Ocean). With these perturbations we identify the relative importance of individual ocean regions to the state of the NAO in the winter of 2019/2020.
We contrast the experiments with the perturbed SST conditions to the operational ECMWF System5 forecast and ERA5. Experiments with the 2019/2020 SST's in the Indian Ocean (with other boundary conditions set to climatology) reproduce many of the observed atmospheric 2019/2020 features. In contrast, experiments with SST's in the Pacific show very different patterns to the observed 2019/2020 ones.
We identify eddy-mean-flow interactions as a mechanism that connects and transports information from the Indian Ocean to the North Atlantic. With Hoskins E-Vectors we show that anomalous eddy activity during IOD events impacts the position and strength of the Northern Hemisphere extratropical jet. This interaction provides a teleconnection mechanism in addition to the Rossby-wavetrain discussed in other studies.