Teleconnection between Australian winter temperature and Indian summer monsoon rainfall

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The pattern of evaporative sources and the direction of the large-scale circulation over the Indian Ocean during the boreal summer raises the question of whether atmospheric conditions in Australia could influence conditions over the Indian subcontinent, despite the long passage of air over the Indian Ocean. The authors propose that such an influence is sometimes possible when there is unusually low temperature over inland Australia during the austral winter, through the mechanism where such a temperature extreme enhances evaporation rate over the eastern tropical Indian Ocean and hence enhances rainfall over two regions in western India after 13–19 days. Results from trajectory calculations indicate that such an influence is mechanistically feasible, with air of Australian origin contributing 0.5–1.5% of the climatological net precipitation for monsoon seasonal rainfall over western India. Statistics performed on reanalysis, satellite and in situ data are consistent with such a mechanism. Since extreme winter temperature in Australia is often associated with cold-air outbreaks, the described mechanism may be an example of how southern hemispheric mid-latitude weather can influence northern hemispheric monsoon rainfall. Further study is recommended through modelling and comparison with various known causes of atmospheric variability to confirm the existence of such a mechanism and determine the extent of its influence during specific low temperature episodes.