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Remote influence of South Atlantic multidecadal variability on Australian summer rainfall

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Austral summer (December–February) rainfall over central and northern Australia is found to be synchronized by South Atlantic sea surface temperature (SST) variability over multidecadal timescales. During austral summer, warm SST anomalies in the southwest South Atlantic correspond to increased precipitation over central and northern portion of the Australia. This decadal timescale remote influence is realized through an South Atlantic–Australia (SAA) teleconnection wave train spanning from the South Atlantic to Australia. The decadal-scale SAA wave train is triggered by SST anomalies in the southwest South Atlantic and propagates eastward to Australia along the westerly jet stream. The excitation of the SAA wave train is further verified by forcing experiments based on both linear barotropic and baroclinic models. During warm conditions of the South Atlantic, the corresponding SAA wave train is characterized by an anomalous anticyclone off the eastern coast of the Australia, and vice versa. Under the impact of this anticyclonic circulation, northern Australia is subject to anomalous northwesterly winds, which bring moisture from tropical ocean to northern Australia and thus favor increased Australian summer monsoon rainfall. Moreover, anomalous northeasterly flows on western flank of the anticyclone bring warm moist air masses from the ocean to central Australia, therefore producing enhanced precipitation over central Australia through convergence of low-level water vapor flux.