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Decadal-scale teleconnection between South Atlantic SST and Southeast Australia Surface Air Temperature in Austral Summer

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Austral summer (December–February) surface air temperature over southeast Australia (SEA) is found to be remotely influenced by sea surface temperature (SST) in the South Atlantic at decadal time scales. In austral summer, warm SST anomalies in the southwest South Atlantic induce concurrent above-normal surface air temperature over SEA. This decadal-scale teleconnection occurs through the eastward propagating South Atlantic–Australia (SAA) wave train triggered by SST anomalies in the southwest South Atlantic. The excitation of the SAA wave train is verified by forcing experiments based on both linear barotropic and baroclinic models, propagation pathway and spatial scale of the observed SAA wave train are further explained by the Rossby wave ray tracing analysis in non-uniform basic flow. The SAA wave train forced by southwest South Atlantic warming is characterized by an anomalous anticyclone off the eastern coast of Australia. Temperature diagnostic analyses based on the thermodynamic equation suggest anomalous northerly flows on western flank of this anticyclone can induce low-level warm advection anomaly over SEA, which thus lead to the warming of surface air temperature there. Finally, SST-forced atmospheric general circulation model ensemble experiments also demonstrate that SST forcing in the South Atlantic is associated with the SAA teleconnection wave train in austral summer, this wave train then modulate surface air temperature over SEA on decadal timescales. Hence, observations combined with numerical simulations consistently demonstrate the decadal-scale teleconnection between South Atlantic SST and summertime surface air temperature over SEA.