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From severe droughts in South America to marine heatwaves in the South Atlantic

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In 2013/14 eastern South America experienced one of its worst droughts, leading to water shortages in São Paulo, the world's fourth most populated city. This event was also responsible for a dengue fever outbreak that tripled the usual number of fatalities and reduced Brazilian coffee production leading to a global shortages and worldwide price increases. The drought was associated with an anomalous anticyclonic circulation off southeast South America that prevented synoptic systems reaching the region while inhibiting the development of the South Atlantic Convergence Zone and its associated rainfall. A concomitant and unprecedented marine heatwave also developed in the southwest Atlantic. Here we show from observations that such droughts and adjacent marine heatwaves have a common remote cause. Atmospheric blocking triggered by tropical convection in the Indian and Pacific oceans can cause persistent anticyclonic circulation that not only leads to severe drought but also generates marine heatwaves in the adjacent ocean. We show that increased shortwave radiation due to reduced cloud cover and reduced ocean heat loss from weaker winds are the main contributors to the establishment of marine heatwaves in the region. The proposed mechanism, which involves droughts, extreme air temperature over land and atmospheric blocking explains approximately 60% of the marine heatwave events in the western South Atlantic. We also identified an increase in frequency, duration, intensity and extension of marine heatwave events over the satellite period 1982–2016. Moreover, surface primary production was reduced during these events with implications for regional fisheries.