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The poleward expansion of subtropical dry zones: spatiotemporal characteristics and links to the extratropics

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Coupled atmosphere-ocean climate models predict that the subtropical dry zones will expand poleward during the current century in response to increasing levels of atmospheric greenhouse gases. This has important implications for water availability in several midlatitude regions, such as southern Europe. Here we describe the spatial and temporal structure of the dry zone expansion in the models, and we compare this response to observed changes in the dry zones during the past few decades. It is shown that the poleward movement of subtropical dry zones and the accompanying changes in tropical atmospheric circulation are closely connected to changes in the extratropical circulation in the models, in particular the simulated positive trends in the Northern Hemisphere and Southern Hemisphere annular modes of climate variability.