

Precipitation responses in the Southern hemisphere subtropics: reconciling palaeodata and climate model projections

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Climate projections and observations over recent decades suggest that precipitation in Southern Hemisphere subtropical latitudes will decline in the near future in response to anthropogenic warming, with significant implications for food production and population sustainability. In contrast to this drier future, reconstructions of subtropical precipitation during geologically recent past warm climates that are often treated as greenhouse analogues, such as the Pliocene epoch, suggest that these regions were uniformly wetter than today.

In trying to reconcile these disparate observations it is important to note that the climate modelling is based upon emissions scenarios with rapidly increasing radiative forcing to the year 2100, in which many components of the Earth system, such as deep oceans, vegetation and ice sheets, have not yet equilibrated with warming. In this study we combined a speleothem based precipitation reconstruction for the Pliocene epoch in Australia with multi-century future climate simulations to demonstrate the potential for a very different outcome – that Southern Hemisphere subtropical drying may be a transient response to rapid warming: as greenhouse gas concentrations and global temperatures stabilise, Southern Hemisphere subtropical regions may experience positive precipitation trends.