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A Precipitation Climatology of the Snowy Mountains, Australia

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The precipitation that falls in the Snowy Mountains region of southeastern Australia provides critical water resources for hydroelectric power generation. Water storages in this region are also a major source of agricultural irrigation, environmental flows, and offer a degree of flood protection for some of the major river systems in Australia. Despite this importance, there remains a knowledge gap regarding the long-term, historic variability of the synoptic weather systems that deliver precipitation to the region.

This research aims to increase the understanding of long-term variations in precipitation-bearing weather systems resulting in runoff into the Snowy Mountains catchments and reservoirs, and the way in which these are influenced by large-scale climate drivers.

Here we present initial results on the development of a climatology of precipitation-bearing synoptic weather systems (synoptic typology), spanning a period of over 100 years. The synoptic typology is developed from the numerical weather model re-analysis data from the European Centre for Medium-Range Weather Forecasts (ECMWF), in conjunction with regional precipitation and temperature data from a network of private gauges. Given the importance of surface, mid- and upper-air patterns on seasonal precipitation, the synoptic typing will be based on a range of meteorological variables throughout the depth of the troposphere, highlighting the importance of different atmospheric levels on the development and steering of synoptic precipitation bearing systems. The temporal and spatial variability of these synoptic systems, their response to teleconnection forcings and their contribution to inflow generation in the headwater catchments of the Snowy Mountains will be investigated.

The resulting climatology will provide new understanding of the drivers of regional-scale precipitation variability at inter- and intra-annual timescales. It will enable greater understanding of how variability in synoptic scale atmospheric circulation affects the hydroclimate of alpine environments in southeast Australia – allowing recently observed precipitation declines to be placed in the context of a long-term record spanning at least 100 years. This information will provide further insight into the impacts of predicted anthropogenic climate change and will ultimately lead to more informed water resource management in the Snowy Mountains.