Characteristics and processes of wintertime precipitation over west Tasmania

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Western Tasmania receives some of the heaviest annual precipitation in Australian with some sites observing, on average, over 3500 mm, roughly twice the amount observed at many tropical sites. This heavy precipitation is known to be driven by orographic processes where the mid-latitude westerly winds commonly drive pristine, moist air off the Southern Ocean over modest mountains, particularly during the winter season. This heavy precipitation drives the hydroelectric industry of the island, which underpins the economy and is one of the largest sources of renewable energy in Australia. The hydroelectric capacity of Tasmania is set to expand in the near future, allowing for greater pump-hydro technology and peak energy production.

The management of this hydroelectric network greatly benefits from accurate precipitation estimates and forecast, particularly as heavy precipitation events commonly lead to spill conditions. Previous studies have shown that the available precipitation estimates are unreliable in this type of complex topography, partly due to the low density of observations, which produces high biases related to the slope of the terrain. These biases are most evident on the windward slopes, where most of the precipitation occurs. Furthermore, comparison of modelled precipitation against available observations show up to 20% underestimation in the windward slopes.

An intensive observation field campaign was conducted during the 2019 winter period, with the goal of increasing our understanding of the unique environment and physical processes that underpin this precipitation. The campaign consisted of three sites at different altitudes in the windward slope of the mountain range, each equipped with an optical disdrometer and a micro rain radar; supported by the local network of rain gauges. The ground sites were located such that we can observe the evolution of the air mass as it crosses the mountains, capturing the development of specific dynamical and microphysical processes. Results from this campaign will be presented, including the relationship between precipitation and synoptic conditions, orographic effects on precipitation phase and intensity, as well as comparisons between site and satellite observations.