This paper focuses on the effects of climate change on the water resources of the Clutha River, in the South Island of New Zealand. We present an analysis of the projected weekly averaged flows of the Clutha at Balclutha, comparing the current situation (1980-1999) with two future time periods (2030-2049 and 2080-2099) for one emission scenario, A1B. Climate predictions of 12 different Global Circulation Models for the A1B scenario (as well as the average of those 12) were used as input to a distributed hydrological model of the catchment.

In the future scenarios, the winter and spring precipitation increases significantly in this catchment. The total yearly streamflow increases in response (~6% for 2040 scenario and ~10% for 2090 scenario), although the relative contribution of snowmelt to streamflow decreases. The most striking change is in the seasonality of streamflow. Streamflow in winter and spring increases substantially, whereas summer and autumn streamflow is relatively unchanged. Two factors contribute to this effect: total precipitation increases over the winter months (up to 40% by 2090), whereas it remains constant or decreases slightly over the summer months; during winter, precipitation falls more often as rainfall (rather than snow) in the future scenarios.

These changes have significant implications for hydropower generation on the Clutha River, since South Island winter generation is currently limited by water availability. Given the extent of the projected climate changes, the results suggest similar changes for the west and south of the island, i.e. approximately half of the South Island.