

A 10-year record of surface meteorology and radiation exchanges from Brewster Glacier in the Southern Alps of New Zealand

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Introduction

- The Southern Alps are surrounded by large open areas of ocean and are strongly affected by the interaction of polar and subtropical air masses.
- The Southern Alps act as a barrier to the prevailing westerly airflow resulting in frequent cloud cover and enhanced precipitation.
- Despite the remote and difficult weather conditions, some high-quality short-term meteorological records of glaciers exist.
- While these records provide useful information about the atmospheric processes occurring in this region, there remains a lack of long-term observational data to assess whether these conditions operate over extended periods.
- The basis of this study is to provide key insights about the meteorology of a benchmark glacier in the Southern Alps.
- We present a 10-year meteorological record using high-quality observational data obtained next to Brewster Glacier in the Southern Alps.

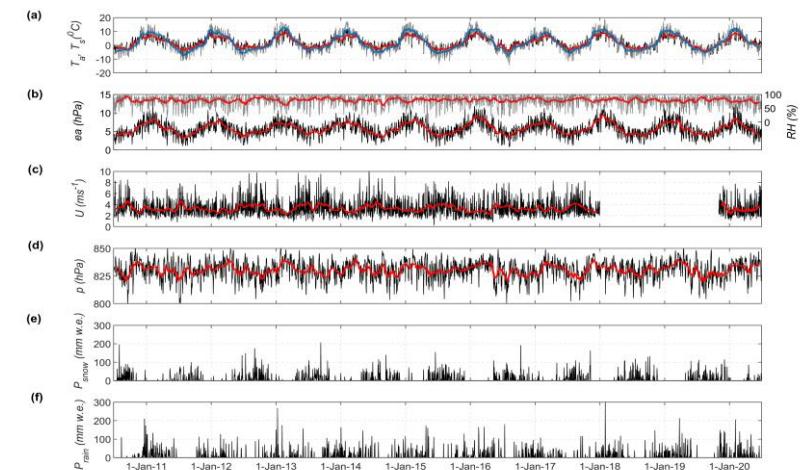
Study site and data collection

- The Southern Alps is home to > 3000 glaciers with a mean elevation of 1896m a.s.l.
- Brewster Glacier is located immediately west of the main divide and covers an area of 2.03 km² with an elevation range of 1706 to 2389 m a.s.l.
- 80% of the glacier lies below 2000 m and is considered highly sensitive to climatic changes.
- The location and elevation suggests that observations from Brewster Glacier are likely to provide valuable insights about the meteorological conditions across the Southern Alps.
- The dataset in this study was collected from an automatic weather station (AWS) located on bedrock next to a small proglacial lake at approximately 1650 m a.s.l.
- The data extends over the period of July 2010 to June 2020.



Above: Brewster Glacier and AWS from left to right: 1. location of the AWS 500m from the terminus of the glacier, 2. AWS.

Findings



Above: Mean daily atmospheric conditions over the study period. Air temperature (T_a), surface temperature (T_s), vapour pressure (e_a), relative humidity (RH), wind speed (U), air pressure (p) and total precipitation as rainfall (P_{rain}) and snowfall (P_{snow}) are presented. The red lines represent the 31-day running means of the other variables.

- Large daily and seasonal variations of T_a are observed. Mean annual T_a over the study period ranges from 1.7 to 2.5 °C.
- The atmosphere is humid year-round with an annual average RH of 79%. Large variations of p represent the frequent movements and changes of high- and low-pressure systems across the Southern Alps.
- Precipitation is frequent with more than 6000 mm w.e. annually.

For more information please refer to my paper:
Abraham, B. N., Cullen, N. J., & Conway, J. P. (2021). A decade of surface meteorology and radiation exchanges at Brewster Glacier in the Southern Alps of New Zealand. *International Journal of Climatology*. Advance online publication. doi: 10.1002/joc.7323