



Control of foehn winds on South Georgia by regional-scale atmospheric circulation

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The subantarctic island of South Georgia (approximately 54 S, 37 W) lies within the belt of strong westerly winds that blow around the Southern Ocean. Interaction of these winds with the island's axial mountain chain, which rises to over 2 km altitude over the central part of the island, generates warm, dry foehn winds on the climatologically downwind side of the island. During foehn, temperatures in this region frequently rise above freezing and, in exceptional cases, may exceed 20 degC. Foehn is thus an important driver of melt on this heavily-glaciated island.

We use observations from an automatic weather station at King Edward Point (KEP) on the northeast coast of the island, together with data from atmospheric reanalyses, to study the occurrence of foehn and its relationship to regional atmospheric circulation. Foehn is observed at KEP for around 30% of the time, with little seasonal variability. On days when foehn is observed, the wind speed at mountain top height is significantly greater than at times when foehn is absent. Interestingly, the main control on the occurrence of foehn is the wind speed at this level, rather than its component perpendicular to the mountain ridge. We find that foehn is generally associated with a strengthening of the regional westerly winds, driven by an enhanced meridional pressure gradient. Simulations with a high-resolution atmospheric model clearly show the development of foehn flow with strong westerly winds.