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Foehn events at Cole Peninsula (Antarctica) in in-situ measurements and model simulations

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1995 and 2002 saw the dramatic break-up and collapse of huge parts of the Larsen Ice Shelf (LIS) on the east of the Antarctic Peninsula (AP). It is widely accepted that hydrofracturing, the widening of crevasses due to the excess hydrostatic pressure exerted by meltwater which accumulates inside them, is the mechanism behind the break-up of the Larsen A and Larsen B ice shelves. On the LIS in the lee of the mountain range that runs along the spine of the AP Föhn winds are thought to provide the atmospheric conditions for significant warming over the ice shelf thus leading to the initial firn densification and subsequently providing the melt water for hydrofracturing.
We examine the representation of Föhn events during 2011 as they were observed in measurements by an Automatic Weather Station, and in simulations with the Weather Research and Forecasting Model (WRF) as run for the Antarctic Mesoscale Prediction System (AMPS). We find that, while the model generally simulates meteorological parameters very well, and shows good skills in capturing the occurrence, frequency and duration of Föhn events realistically, it underestimates the temperature increase and the humidity decrease during the Föhn significantly, and may thus underestimate the contribution of Föhn to driving surface melt on LIS. Our results indicate that the misrepresentation of cloud properties and particularly the absence of mixed phase clouds in AMPS, affects the quality of weather simulation under normal conditions to some extent, and to a larger extent the model's capability to simulate the strength of Föhn conditions adequately.