Summertime surface layer winds over the Darwin-Hatherton Glacial System: observations and numerical analysis with Polar-WRF

In alphabetical order

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Abstract

Much research has focused on the surface layer air flow over the Ross Ice Shelf (RIS) and the McMurdo Dry Valleys (MDV). There is now a relatively good understanding of physical mechanisms that drive the low level meteorology in these areas. There is much less information available about the surface flow within the glaciated valleys in the Transantarctic Mountains. We present findings from a small scale field campaign that was conducted in the summer of 2008/09, which involved three automatic weather stations installed over the Darwin-Hatherton Glacial System (DHGS). Although the stations were approximately less than 20 km apart, they show quite complicated heterogeneous flow features. We provide observational and numerical analysis, using the Polar version of Weather Research and Forecasting (WRF) model, from specific cases to elucidate the forcing mechanisms that govern valley flows over the DHGS.

Two interesting episodes will be discussed; the first episode is from a strong katabatic event, where the synoptic scale flow north of the RIS is rather zonal, favouring the outflow of katabatic wind onto RIS. Surprisingly, not all stations detect the katabatic flow within the DHGS. The second case is under settled synoptic conditions with a more meridional synoptic scale forcing, where barrier type winds dominate the flow over the RIS. For this episode, diurnally reversing upslope winds are detected at the lower reaches of the glaciated valley.