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A case study of a Ross Ice Shelf Airstream event using high resolution observational data captured by SNOWWEB

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The Ross Ice Shelf Airstream (RAS) is the dominant weather pattern over the Ross Ice Shelf in Antarctica. Characterised by a strong southerly flow over the ice shelf, the RAS plays a significant role in the northward transport of cold air from the interior of the continent out into the Ross Sea. As it passes by Ross Island – home to McMurdo Station and Scott Base – and out over the edge of the ice shelf, the RAS also helps to create and maintain the Ross Sea Polynya, the single largest contributor to sea ice growth in the Ross Sea region. Our area of interest is the McMurdo Ice Shelf, situated directly south of Ross Island and adjoining the north-western tip of the much larger Ross Ice Shelf. The terrain of this region is complex, with large mountains, islands, and cliffs dominating local flow. Additionally, severe weather – often experienced during a RAS event – can greatly impact human activity. These two factors make this region particularly interesting to study. During the 2013/14 austral summer season we deployed 14 weather stations on the McMurdo Ice Shelf, creating a dense spatial observational network. In combination with existing automatic weather stations and high resolution model output from the Antarctic Mesoscale Prediction System (AMPS), we present a case study of a three day RAS event observed in November 2013. We find that AMPS represents the RAS well in general, however at the local scale there are some large discrepancies between observed and forecast winds. Predominantly these are a result of errors in timing, with AMPS incorrectly forecasting 'lulls' in the RAS when none were observed and vice-versa. There also appear to be some differences between AMPS and observations regarding the split of the southerly RAS flow around Ross Island. The representation within AMPS of both Hut Point Peninsula – a small yet important orographic feature running south-west from Ross Island that blocks relatively weak flows – and the Windless Bight high pressure stagnation zone play a role in this. Finally, temperature comparisons show a consistent cold bias within AMPS. Additionally, AMPS temperature forecasts indicate a diurnal cycle when observational data shows no obvious cycle, likely due to cloud conditions and air movement overwhelming diurnal variations during the permanent daylight of the summer season.