



Spatial variation of snowfall accumulation



on Antarctica's Ross Ice Shelf

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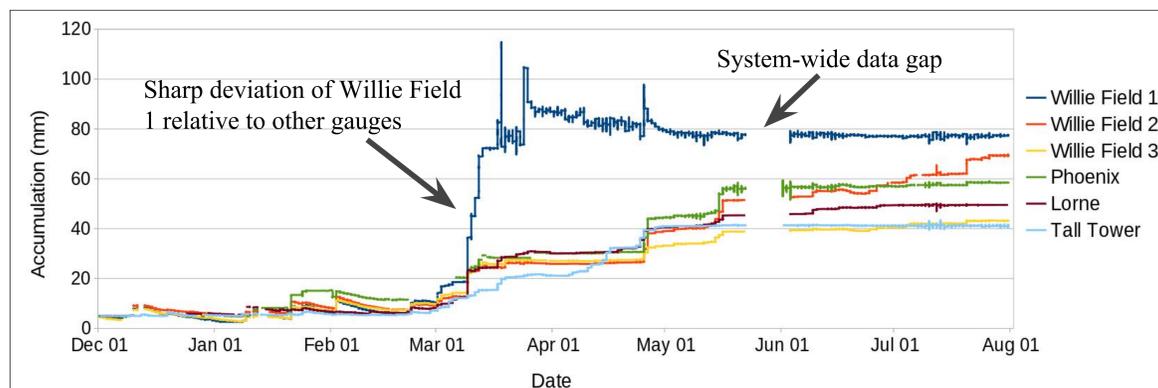
National Center for Atmospheric Research (NCAR),
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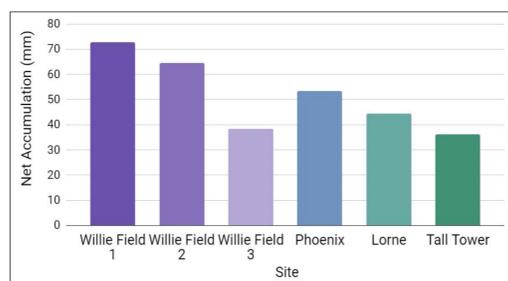
Introduction

Antarctica is a relatively understudied area, where we primarily use the *Antarctic Mesoscale Precipitation System* (AMPS) weather model to estimate and predict snowfall amounts. Understanding snow accumulation in Antarctica may help us calculate the snowmass budget of its ice sheets and adjust estimates of sea level rise due to melting. In this study, automated weather instruments were installed to measure liquid water equivalent (LWE) amounts of snowfall across four field sites on the Ross Ice Shelf during an 8-month period and used to determine variation of snow accumulation.

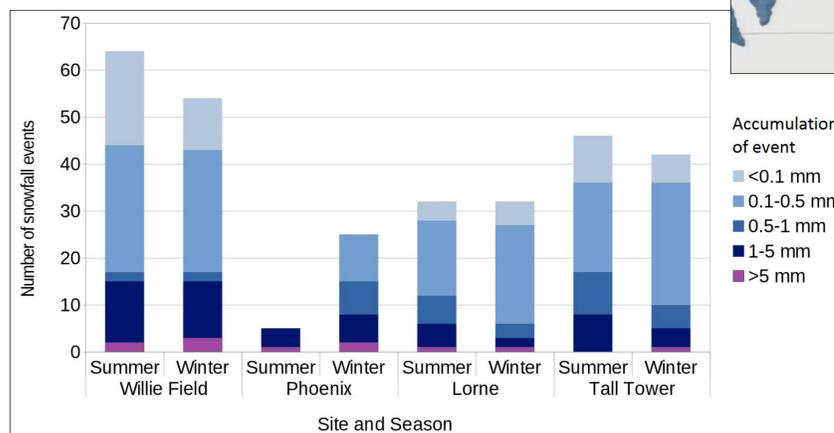
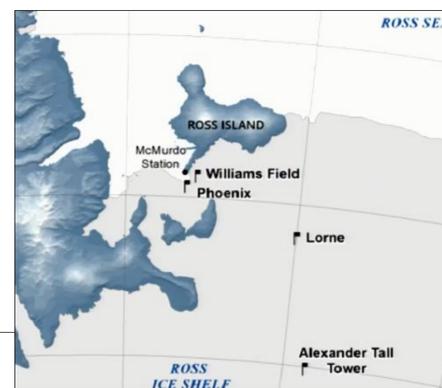
Results



Accumulation over the 8-month duration. Starting values were equalized for easier comparison.



(Left) Net accumulation for each gauge over the 8-month duration.



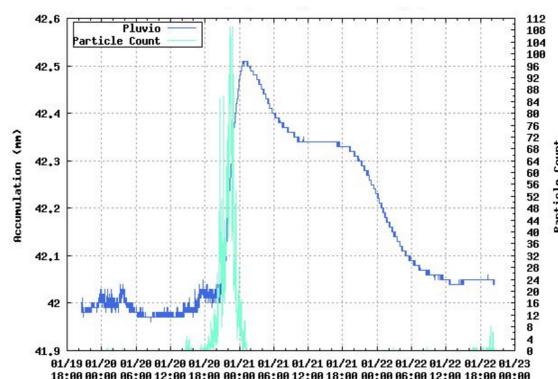
(Left) Number of identified snowfall events for each site. Summer is defined as December 01-March 31 and Winter is April 01-July 31. The Willie Field 2 gauge is used due to its similarity to nearby Phoenix.

Conclusions

- The two sites more inland of the Ross Ice Shelf accumulated less snowfall, likely due to terrain effects of local, snowfall-enhancing upslope effects. This suggests ice sheet growth may be greater near Antarctica's coastlines
- The accumulation data is noisy at short timescales and likely reduces the accuracy of event identification
- Snow events were often followed by sublimation events, appearing greatest in summer and minimal in winter
- There were significant differences in accumulation between the Willie Field gauges that may not be fully accounted for by their varied shielding instruments. More research is needed to identify the source of this variation

Materials and methods

- Automated systems, including the Ott Pluvio² gauge and Optical Precipitation Detector, were installed in Nov 2017 for each site
- Snow events, gaps, and anomalies were identified using the NCAR-developed Antarctica webplots.
 - Qualifying events showed sharp, coupled increases in accumulation and particle count distinct from surrounding noise
- Events were sorted by LWE and date
- The raw Pluvio² data for all sites were cleared of faulty data (e.g. extreme rises/drops, negative values) and plotted, zeroed for amount comparison



Example of identifiable snow event on webplots

Acknowledgments

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Future study

- Continue to gather snowfall data over several years and expand to farther sites on the Ross Ice Shelf and Antarctica more generally
- Do maintenance checks on the gauges to minimize error
- Find more reliable methods for identifying snow events, as current methods are subjective
- Compare in situ precipitation measurements to WRF model amounts
- Determine how sublimation rates vary across sites to understand the snow mass budget

Literature cited

Landolt, S., & Gaydos, A. (2018). Winter Weather Group - Antarctica Project Info. Retrieved from <https://www.rap.ucar.edu/projects/winter/sites/antarctica/index.php?22mjkh0bmnui7gbbq4tb5b4s0>