

Precipitation over Land and the Southern Ocean (PLATO) Field Campaign Report

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Acronyms and Abbreviations

AAD	Australian Antarctic Division
ARM	Atmospheric Radiation Measurement
DOE	U.S. Department of Energy
MARCUS	Measurements of Aerosols, Radiation, and Clouds over the Southern Ocean
MRR	Micro Rain Radar

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1.0 Summary

In order to complement the precipitation data collected as part of the U.S. Department of Energy Atmospheric Radiation Measurement (ARM) Measurements of Aerosols, Radiation, and Clouds over the Southern Ocean (MARCUS) campaign deployment aboard our Australian Antarctic Division (AAD) icebreaker *Aurora Australis* during summer 2017/18, we installed a Metek Micro Rain Radar (MRR-PRO model) and an Eigenbrodt OceanRAIN disdrometer on the monkey island. Biases in absorbed shortwave radiation over the Southern Ocean in numerical models compared to observations are most likely associated with biases in the representation of cloud microphysical properties such as liquid cloud droplet concentration and liquid water path that can be assessed by understanding precipitation together with cloud phase. The addition of these two AAD instruments will, together with MARCUS, enable studies relating precipitation and cloud properties (drop size distribution, number concentration, and modal diameter) to aerosol properties over the Southern Ocean.

We deployed the disdrometer for all four voyages of *Aurora Australis* during summer 2017/18. The MRR was installed on Voyage 1 (Davis Base resupply) and again on Voyage 4 (Macquarie Island resupply), but was removed for the other two voyages due to commitments elsewhere. Instead of using up one ship's expeditioner berth for our own technician to monitor these instruments, we asked the ARM technicians, through the ARM field campaign office, to monitor data collection of the MRR and disdrometer and notify me of any issues. The MRR performed well on the voyages and collected data nearly continuously. However, the disdrometer's performance was very disappointing, with very little data collected at all. This seems due to instrumental faults; indeed we thank the ARM technicians who performed as much technical diagnostics as were possible while aboard.

At the time of writing (March 2019), we have not yet calibrated the MRR nor retrieved the limited disdrometer data from the raw data collected. We anticipate this calibration to be completed before the end of this year. Eventually, the following data sets will be retrieved, or derived from the parameters collected by the instruments:

1. MRR: Radar reflectivity (Z), rainfall and snowfall rate, precipitation phase, liquid and ice water content, vertical profiles of retrieved drop and snow size distribution and associated parameters (number concentration and modal diameter) using statistical information derived from the disdrometer, melting layer height.
2. Disdrometer: measured particle size distribution and associated parameters (number concentration and modal diameter), surface precipitation intensity for rain, snow, and mixed-phase, occurrence, accumulation, precipitation phase and probability, terminal fall velocity, and estimated radar reflectivity (Z) using T-matrix calculations, ancillary meteorological data.

2.0 Results

We have not reached the stage of instrument calibration and precipitation parameter retrieval, so have no results yet.

3.0 Publications and References

None have been produced yet.

4.0 Lessons Learned

I acknowledge the good level of support provided by the ARM technicians (particularly on Voyage 1) for their help in diagnosing issues and fault-finding of the disdrometer, and for ensuring that the MRR was still happily collecting data.



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