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# Contributions to Southern Ocean cloud condensation nuclei inferred from water uptake and volatility

Cravigan, L.<sup>1\*</sup>, Ristovski, Z.<sup>1</sup>, Alroe, J.<sup>1</sup>, Mallet, M.<sup>1</sup>, Miljevic, B.<sup>1</sup>, Selleck, P.<sup>2</sup>, Keywood, M.<sup>2</sup>, Ward, J.<sup>2</sup> and Molloy, S.<sup>2</sup>, Humphries, R.<sup>2</sup>

1. *ILAQH, Queensland University of Technology, Brisbane, 4000, Australia*

2. *CSIRO Marine and Atmospheric Research, Aspendale, Victoria, Australia*

\* [luke.cravigan@qut.edu.au](mailto:luke.cravigan@qut.edu.au)

## Abstract

Seasonal variations in cloud condensation nuclei (CCN) and cloud droplet number concentrations associated with biological activity have been observed over the Southern Ocean and have been linked to non-sea salt (nss) sulfate and organic aerosol concentrations. Observational campaigns over the sparsely observed Southern Ocean are important to quantify nss-sulfate and sea spray aerosol (SSA) sources and reduce the uncertainty in aerosol cloud interactions.

In recent years QUT have contributed volatility and water uptake measurements to a number investigations of remote marine aerosols. These projects include the Surface Ocean Aerosol Production (SOAP) study on-board the RV Tangaroa (NIWA, Wellington) in February/March 2012, the Cold Water Trials of the RV-Investigator (CSIRO, Hobart) in January/February 2015, and the Clouds, Aerosols Precipitation, Radiation and Atmospheric Composition Over the Southern Ocean (CAPRICORN) project in March/April 2016 (RV-Investigator). This presentation will outline the water uptake properties of marine aerosol species and their importance to CCN and cloud droplet concentrations.

The contribution of SSA and nss-sulfates to the number of available CCN has been estimated based on water uptake and volatility measurements and will be discussed. Marine aerosol concentrations at peak CCN sizes (<200 nm) are generally dominated by nss-sulfates. SSA is more transient, yet can significantly enhance CCN concentrations when present. The organic enrichment of SSA at CCN sizes is poorly characterised and highly uncertain in the Southern Hemisphere. Size dependent organic SSA fractions were also calculated based on water uptake and volatility measurements, and their influence on CCN will also be presented. These observations, and further like it, are key to refining model representation of CCN and cloud formation over the Southern Ocean.

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