



Vertical profiling of clouds and aerosols across the Southern Ocean

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We present highlights of recent Australian-led clouds and aerosol research over the Southern Ocean and coastal East Antarctica as part of the broader SOCRATES field campaigns. Using a combined Raman-elastic backscatter lidar deployed aboard a ship, we quantify the properties of aerosols within the remote Southern Ocean marine boundary layer between 43°S and 66°S. In clean, marine air, we determine a lidar ratio of $S = (18 \pm 2)$ sr, aerosol optical depths within the well-mixed near-surface layer of $\tau = (0.12 \pm 0.08)$ north of 55°S and $\tau = (0.07 \pm 0.04)$ further south. Dried sea salt is observed in the lower part of dehumidified decoupled layers across all latitudes. Merging cloud data from this lidar and a W-band cloud radar allows us to quantify various cloud properties across the Southern Ocean; we will also present results of the differences in cloud properties across the oceanic polar front boundary. Lastly, we present the seasonal cycle of cloud properties at Macquarie Island (54°S) based on data from our lidar and the cloud radar. Initial highlights from our current Davis (69°S) deployment will also be presented.