Relationships Between Giant Sea Salt Particles and Clouds

Airborne data and MERRA-2 reanalysis data are used to determine the extent to which a size distribution parameter and a cloud water chemical measurement can capture the effect of giant cloud condensation nuclei, specifically giant sea salt (GSS), on marine low level cloud properties.

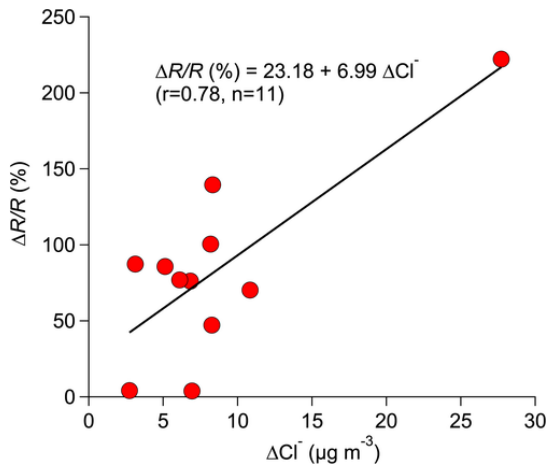
Xubin Zeng's MAP Project

Low level cloud cases with high GSS concentrations coincide with enhanced mean columnar drizzle rate.

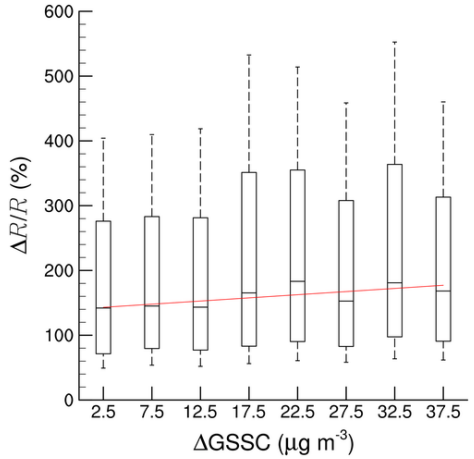
The proxies (near-surface particle number concentration for diameter >5 μm and cloud water chloride concentration, Cl^-) are correlated with each other and have relationships with other parameters that would be expected from sea salt emissions.

The difference in drop effective radius between high and low chloride conditions decreases with height in cloud, suggesting that some GSS produced raindrops precipitate before reaching cloud tops.

The sign of the cloud responses to perturbations in GSS is similar between MERRA-2 and the aircraft data, but the magnitude of the responses is weaker in MERRA-2.



The relationship between the observed change in drizzle rate (relative to that of the low drizzle rate case) and the change in cloud water Cl^- (a proxy for GSS concentration).



The similar relationship with GSS concentration in MERRA-2.

Reference: Dadashazar et al., 2017: Relationships between giant sea salt particles and clouds inferred from aircraft physicochemical data. *J Geophys Res-Atmos*, 122, 3421-3434, doi:10.1002/2016JD026019.

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