

In-situ aerosol optical measurements from Graciosa, Azores

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In-situ measurements of aerosol optical and cloud forming properties

Measured Parameters

Scattering coefficients: at 450, 550, 700 nm at sub 10 micron and sub micron size cuts as a function of RH

Backscattering coefficients under similar conditions

Absorption coefficients: at 467, 530 and 660 nm at sub 10 micron and sub micron size cuts

Particle number concentration

Cloud Condensation Nuclei concentrations: 7 supersaturations and 20 droplet size bins

Calculated Parameters

Single Scattering Albedo at 450 550 and 700 nm

Hygroscopic Growth Factor, f_{RH}

Asymmetry Parameter, Backscatter Fraction

Ångström Exponent

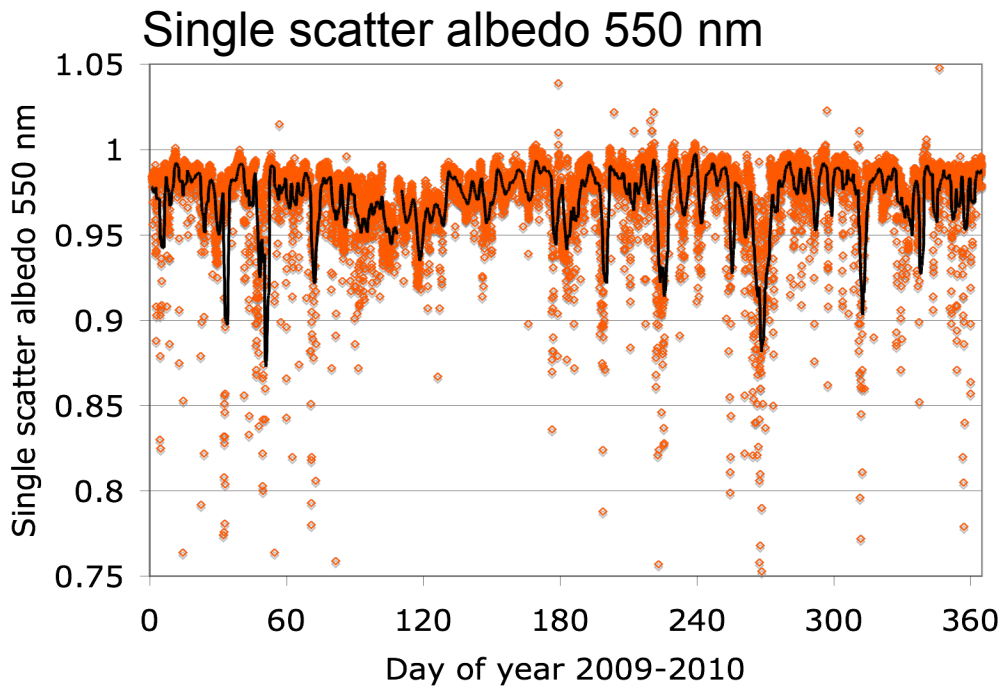
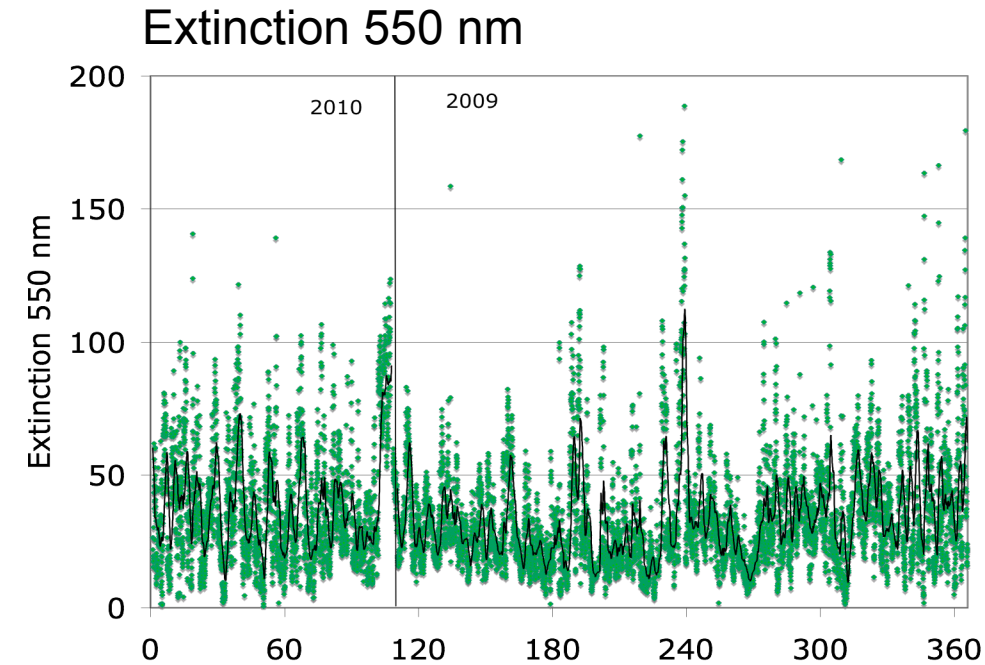
Sub micron scattering fraction

Radiative forcing efficiency

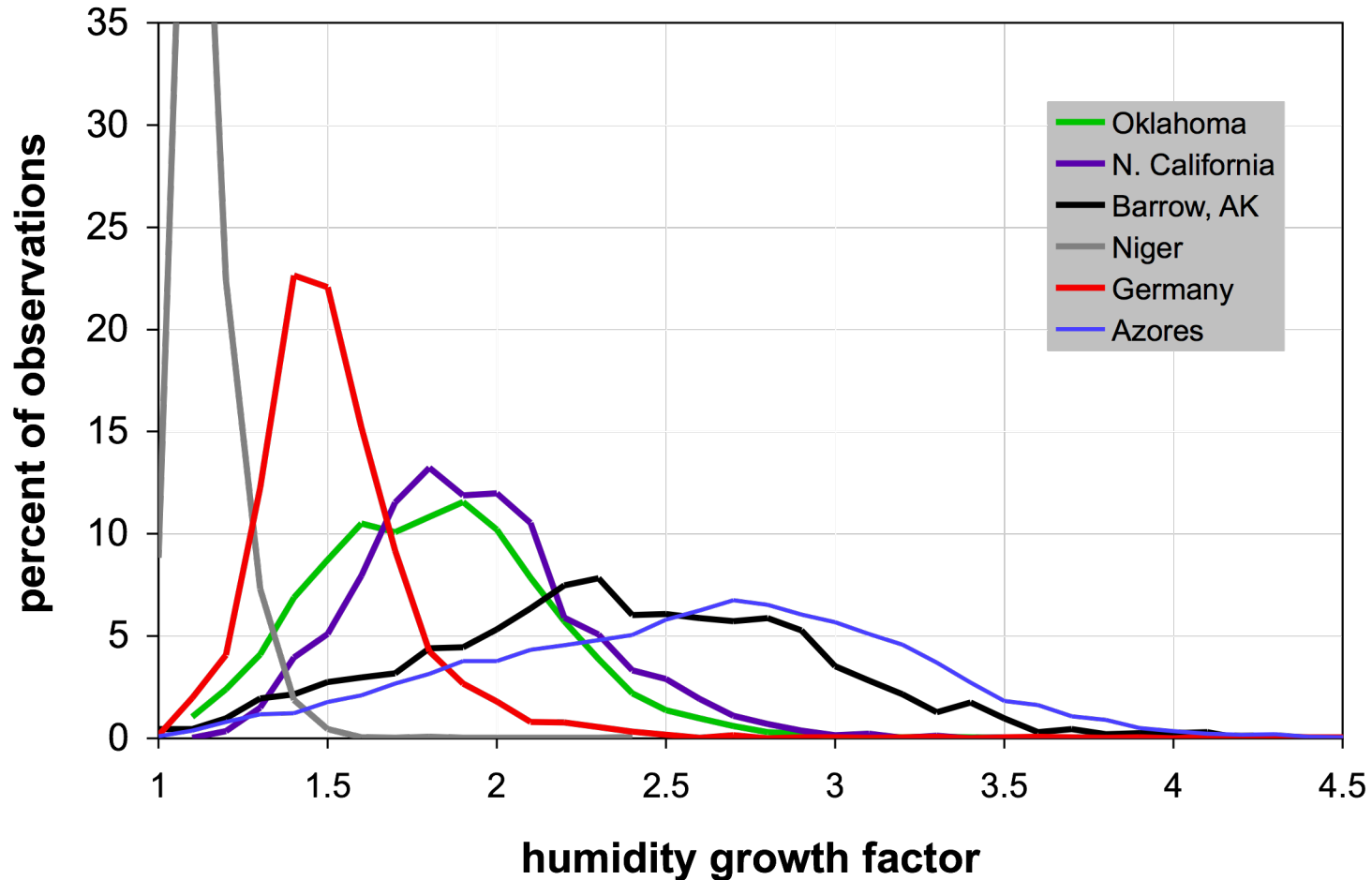
Fraction of particles that form CCN

Seasonal variation of aerosol properties

Changes in aerosol loading and type seem to vary episodically and not much with the season.

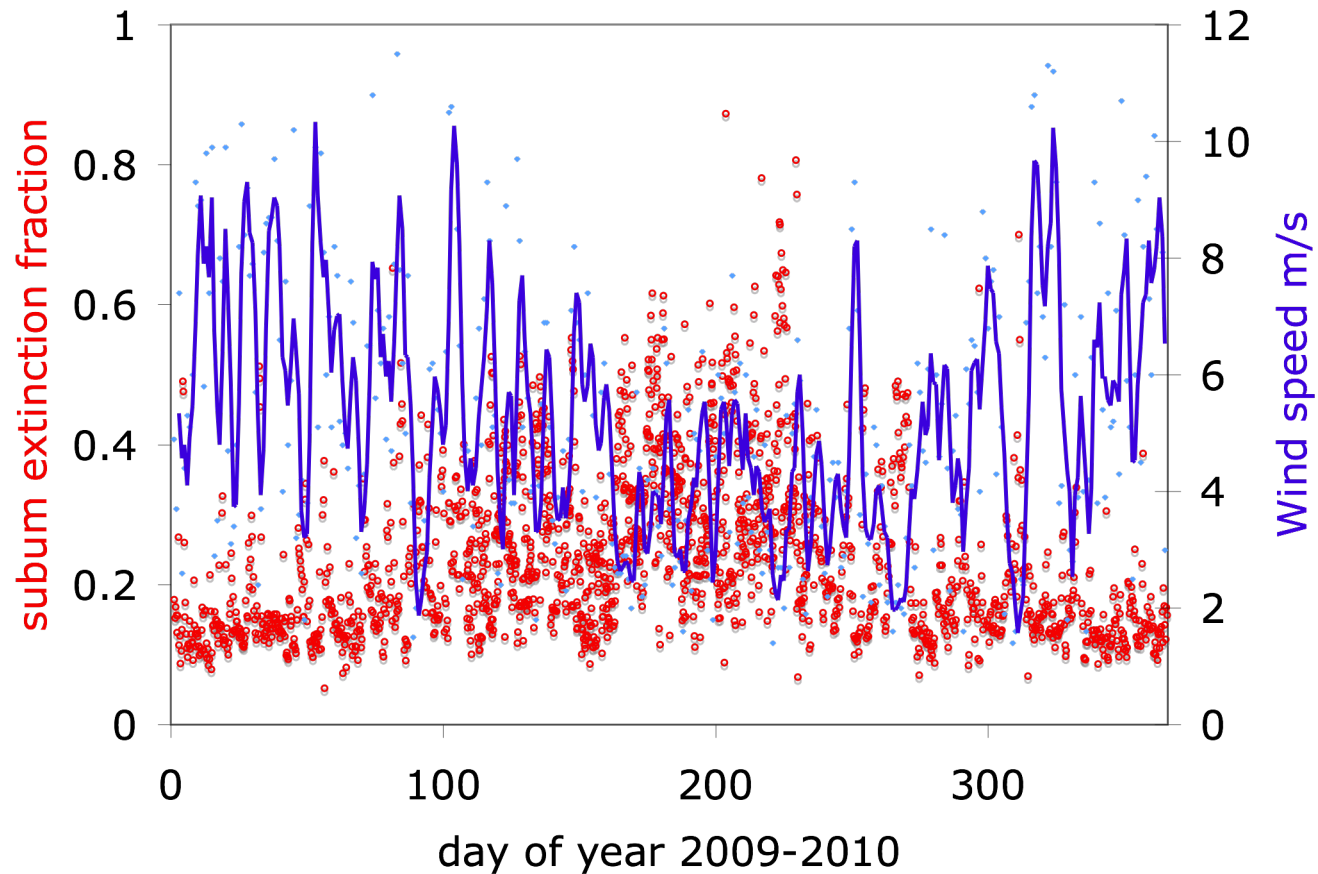


Frequency distribution of hygroscopic growth at 85%/40% RH



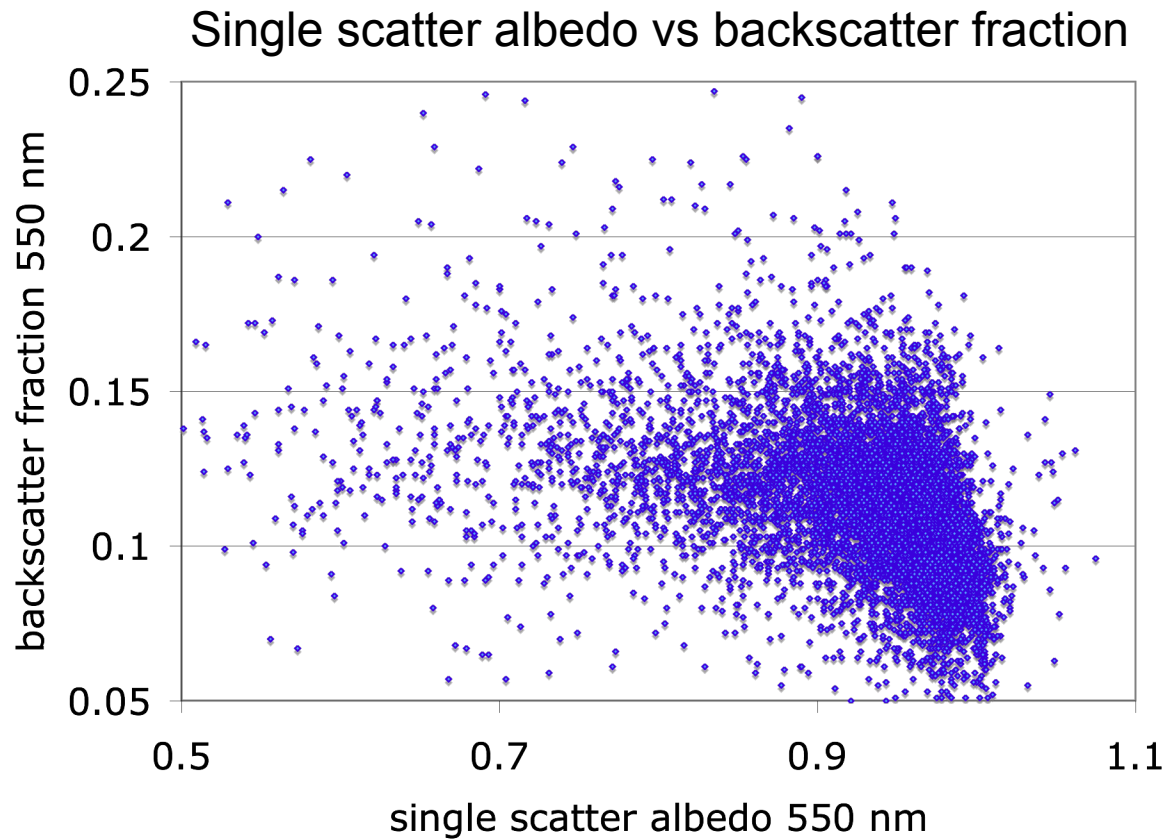
Sea salt $f(RH)$ distribution is broad and depends more on the aerosol size. Large aerosol will grow out of effective scattering regime and exhibit a lower $f(RH)$.

Variation in aerosol size with wind speed



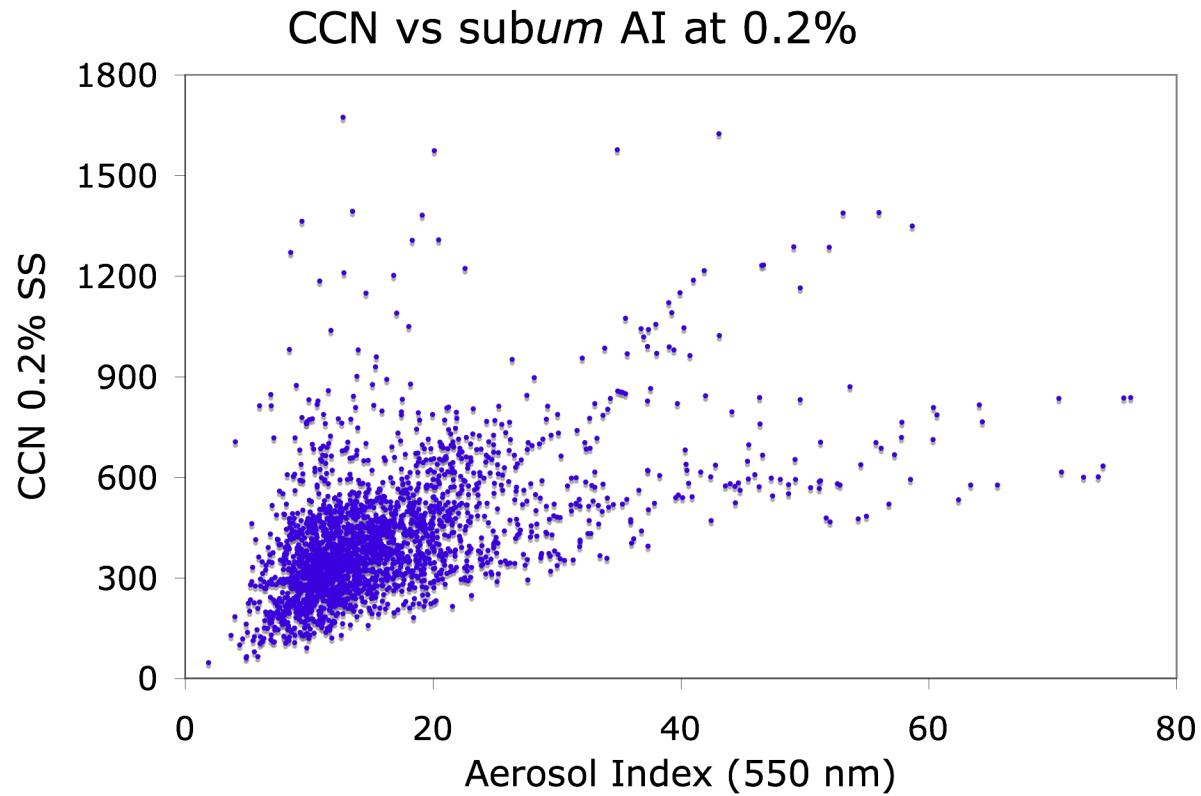
An unusually large fraction of the aerosol extinction was in the coarse mode, $> 0.8 \mu\text{m}$, such that the coarse mode aerosol dominated the extinction at the surface. This has never been observed with such regularity at other ARM or NOAA marine sites.

Covariance of aerosol properties



Smaller particles are darker. *Subum* fraction is relatively large as backscatter fraction doesn't go much above 0.17.

Correlation between aerosol optical properties and CCN



CCN varies with both the aerosol amount and size.

Summary

Aerosol at GRW is characteristic of sea salt with low Ångstrom and backscatter fractions and high single scatter albedo values.

The amount of coarse mode aerosol varied with the wind speed.

Small, dark pollution-type aerosol was seen episodically and didn't exhibit a strong seasonal dependence. This may not be true above the mixed layer.

The CCN concentration varies with the submicron aerosol index (AI).