

AEROSOL-CLOUD INTERACTION FROM AIRCRAFT OBSERVATIONS IN VOCALS

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ABSTRACT

During the VOCALS field campaign, the U.S. DOE G-1 aircraft was used to make cloud and aerosol measurements. Flight plans were designed so that cloud penetrations could be associated with pre-cloud (or sub-cloud) aerosol particles around which cloud droplets formed. This poster describes the aerosol size distributions and the relation between pre-cloud aerosol and cloud droplet number concentration. Sub-cloud aerosol typically had an Aitken and accumulation mode separated by a Hoppel minimum at 70 to 90 nm. Sub-micron aerosol had an average composition of 1/4 neutralized H₂SO₄ (i.e. H_{1.5}(NH₄)_{0.5}SO₄) with a 10% admixture of organics that reflected large SO₂ emission rates from smelters and power plants located near the coast of Chile. Aerosol with this composition is expected to be easily activated as confirmed by CCN measurements. At a supersaturation of 0.2%, particles with a diameter greater than ~ 100 nm are on average activated. Variations in aerosol composition were minor. Cloud droplet number concentration (CDNC) as a function of below-cloud aerosol are shown in the attached figure. Results are within the range of values obtained at different locations by other investigators. Measurements of dried interstitial aerosol from a DMA and PCASP in the cabin and from a PCASP mounted outside of the aircraft indicate a significant fraction of large particles in the size range 150–300 nm. Partially dried cloud droplets appear at larger sizes in the nose-mounted PCASP. Mechanisms for the creation of a population of large hygroscopic interstitial particles are discussed.

This poster will be displayed at ASR Science Team Meeting.

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