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Aerosol particles in the Mexican East Pacific Part I: processing and vertical redistribution by clouds

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Abstract. Airborne measurements of aerosol particle size distributions were made in the Mexican Intertropical Convergence Zone. The volume concentrations of submicron and super micron particles at cloud base were compared with those in near-cloud regions over a range of altitudes. Of 78 near-cloud regions analyzed, 68% and 45% had enhanced volumes of submicron particles and supermicron particles, respectively. In addition, 35% of these regions had supermicron particles removed, presumably by precipitation. In 61% of the cases the enhancement in volume occurred over the size range from 0.1 to 50 μm whereas only submicron volumes were enhanced in 35% of the cases. In regions near clouds that were formed in air of maritime origin the frequency of volume enhancement decreased with increasing altitude and was twice as frequent on the dissipating side of clouds compared to the growing side. No such differences were found in the regions near clouds formed in air originating from the land. The frequency and average magnitude of volume enhancement are in qualitative and quantitative agreement with previous observational and theoretical studies that relate enhancements in particle mass to the uptake by cloud droplets of SO_2 accompanied by additional growth by droplet coalescence.

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