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Composition and mixing state of wet season fine mode aerosol collected in the Amazonian tropical rain forest (Manaus, Brazil)

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Single particle analysis of aerosol particles was performed on samples collected in the tropical rain forest (Manaus, Brazil) during the AMAZE campaign in February and March 2008. During wet season, Amazonia is one of the few places on Earth where natural continental aerosol, unperturbed by anthropogenic influences, can be investigated. Elemental composition, morphology and mixing states of aerosol particles were determined using SEM-EDX. Individual particles were also investigated using NanoSIMS. The particle number distribution is dominated by droplets of organic aerosol (OA) and shows a pronounced Hoppel gap separating the Aitken and accumulation mode. The Hoppel gap is believed to differentiate those particles that have been subjected to in-cloud processing from those that have not. We observe that all Aitken mode particles are pure droplets of organic aerosol (OA), while $10 - 50\%$ of organic droplets in the accumulation mode are mixed with inorganic salts, indicating that wet processing plays an important role in the formation of large organic aerosol droplets. Wet processing also leads to organic coatings on all other particle classes observed. The frequency of organic coatings depends strongly on the CCN activity of the particles involved. Less than 2% of the mineral dust particles show organic coatings. Whereas more than 35% of all solid organic matter (and/or soot particles), more than 50% of all primary biogenic particles, and 80% of all inorganic salt particles are coated with organics. Even though combined SEM/EDX/NanoSIMS analysis does not allow speciation of the organic carbon involved, it provides valuable insight into the mixing state of pristine continental aerosol particles and allows investigating the implications for the hygroscopic behavior, cloud activation properties, and the optical properties of particles.