



## **Hygroscopicity of atmospheric particles in the Caribbean: the impact of organics using the EQSAM3**

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We present first results on how the hygroscopic growth of natural sea-salt aerosols changes with air masses of different origin and with different pollution levels (e.g. organics) in the Caribbean islands. For this purpose we used aerosols samples collected as part of the *Rain in Cumulus over the Ocean Experiment* (RICO) during December 2004 and January 2005 in two different ground-based marine sites in the Caribbean: Dian Point (DP), Antigua and Cape San Juan (CSJ), Puerto Rico. The thermodynamic model EQSAM3 (Metzger and Lelieveld, 2007) was used to determine the water uptake of the collected aerosol samples. EQSAM3 (Equilibrium Simplified Aerosol Model) allows a consistent calculation of the aerosol composition and the gas/liquid/solid partitioning of various mixed inorganic/organic multicomponent solutions, due to an explicit treatment of aerosol hygroscopic growth that is based on efflorescence and deliquescence relative humidities (hysteresis effect).

The aerosol samples were collected using a 13-stage Dekati low-pressure impactor ( $D_p$  0.1 to 10  $\mu\text{m}$ ), a 10-stage micro-orifice uniform deposit impactor ( $D_p$  0.054 to 18  $\mu\text{m}$ ), and stacked-filter units ( $D_p < 1.7 \mu\text{m}$ ).  $\text{Na}^+$ ,  $\text{NH}_4^+$ ,  $\text{K}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{Cl}^-$ ,  $\text{NO}_2^-$ ,  $\text{NO}_3^-$ ,  $\text{SO}_4^{2-}$ , acetate, formate, malonate, and oxalate were determined using ion chromatography. Thermal-optical analysis was used to determine the concentrations of aerosol total carbon (TC), organic carbon (OC), and elemental carbon (EC). The chemical characterization together with the five-day back trajectories calculated using the NOAA's HYSPLIT (HYbrid Single-Particle Lagrangian Integrated Trajec-

tory) model allowed the identification of air masses coming from the North Atlantic (maritime air), Northwest Africa (desert dust), and North America (anthropogenic pollution). The measured ion concentrations were then used for aerosol composition calculations with EQSAM3 to determine the neutralization reactions, the water mass associated with inorganic and organic salt compounds, and the associated growth factors (GFs).

Results for size-resolved water uptake calculations showed that the GFs of the accumulation mode particles are closer to reference calculations of pure sea salt. Aitken and coarse mode particles showed considerably lower GFs. The magnitude of these factors showed a strong dependence on the air mass origin and the level of air pollution (e.g., sulfates and organics). We further show the humidity effect of various organics compounds on the GF and aerosol water mass.