Results of Aerosol Hygroscopicity During The Two-Column Aerosol Project (TCAP) Campaign In the Frame of the NOAA Network

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Aerosol optical and microphysical properties have a strong dependence on the Relative Humidity (RH). Knowledge of this RH effect is of great importance for climate forcing calculations and for comparison of *in situ* measurements with satellite and remote sensing retrievals. The scattering enhancement factor, f(RH), is defined as the ratio of the scattering coefficient at a high and reference RH. In this study, aerosol optical properties were measured by the DOE/Atmospheric Radiation Measurement Program Mobile Facility in the framework of the TCAP deployed at Cape Cod. Over the study period, higher f(RH=80%) values were observed for wind directions from the marine sector together with high Single Scattering Albedo (SSA) and low Scattering Ångström Exponent (SAE) values. The anthropogenically-influenced sector was characterized by smaller, darker and less hygroscopic aerosols. The relationship between aerosol hygroscopicity and other aerosol parameters like SSA and SAE has been explored and we propose an exponential equation that successfully estimates aerosol hygroscopicity as a function of SSA at Cape Cod. In order to check the validity of this estimation at other sites, we selected a number of measurement sites where different aerosol types predominate (pristine marine, polluted marine, dust dominated, agricultural and forest environments). As can be seen in Figure 1, higher aerosol hygroscopicity was observed in marine environments, slightly lower for marine sites with anthropogenic influence and even lower for continental sites. The lowest value was obtained for dust dominated aerosols. In most cases, the scattering enhancement decreases as the SSA decreases, that is, as the contribution of absorbing particles increases. On the other hand, for marine influenced environments the scattering enhancement clearly increases as the contribution of coarse particles increases (SAE decreases), evidence of the influence of hygroscopic coarse sea salt particles.

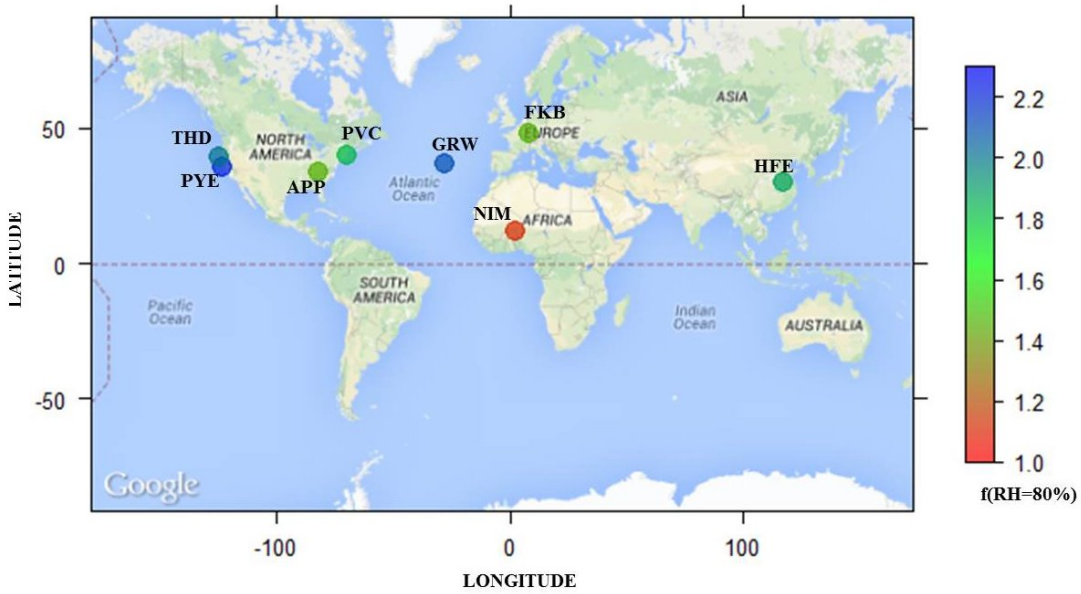

Figure 1. Location of the measurement sites. The color code represents the magnitude of the scattering enhancement (larger values of f(RH=80%) indicate a higher hygroscopicity of the aerosol particles).