Black Carbon's Contribution to Aerosol Absorption Optical Depth in South Korea

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Aerosol absorption optical depth (AAOD), as monitored by ground-based AERONET sites, is essential for estimating radiative forcing from absorbing aerosols in global models, but few validation studies comparing *in situ* aerosol observations and ground-based AAOD exist. Globally, AAOD derived from emission-based models is scaled by as much as 6x for consistency with AERONET measurements. Systematic, repeated vertical profiles measured during the 2016 Korea-United States Air Quality (KORUS-AQ) campaign in South Korea near Seoul provided significant temporal coverage of vertically resolved aerosol properties in a single location (Figure 1). The NOAA Humidified Dual Single Particle Soot Photometer (HD-SP2) monitored black carbon (BC) mass, size distributions, mixing state, and hygroscopicity of BC containing aerosols. Significant variability in vertically resolved BC concentrations and microphysics was observed due to varying meteorological conditions and source regions. Along with bulk aerosol size distributions and optical properties and on-board sky radiance measurements, AAOD derived from measurements is compared with AAOD measured at co-located AERONET sites to evaluate closure between *in situ* and ground-based observations. These measurements revealed absorption by internally-mixed BC can explain the majority of absorption over South Korea (at 660 nm).

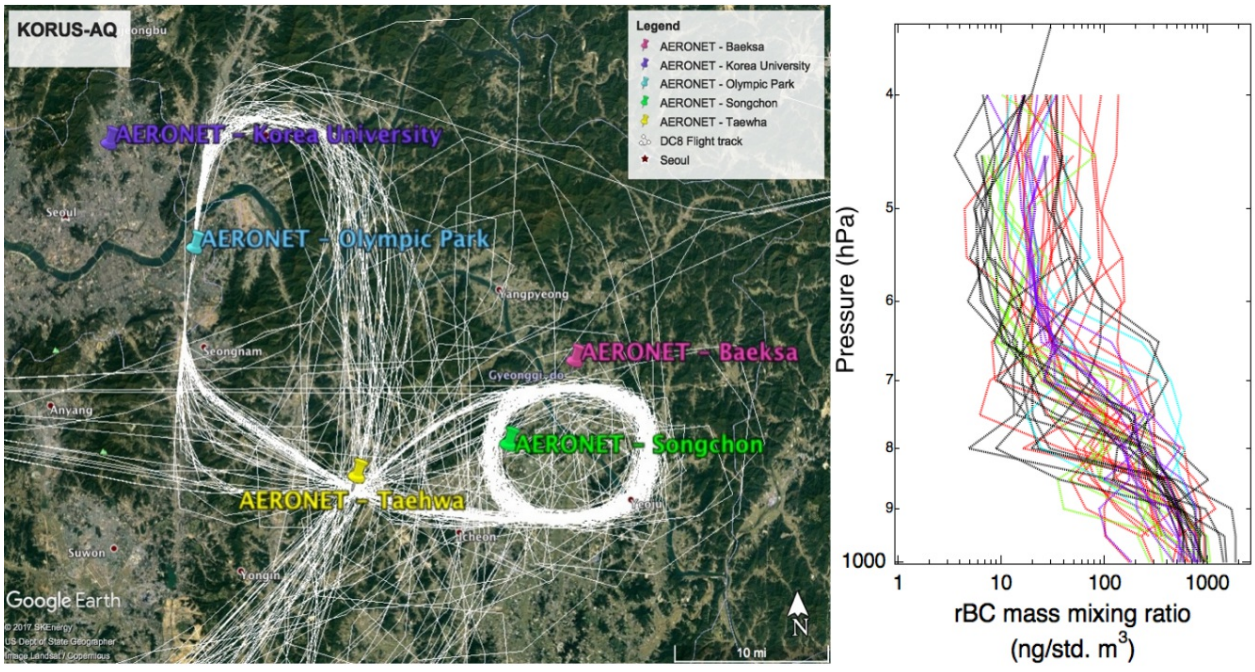

Figure 1. KORUS-AQ flight path over the Seoul Metropolitan Area, with locations of AERONET ground sites **(left)** and BC vertical profiles **(right)**. Multiple spirals over Taehwa Research Forest (~30 km SE of Seoul) provided 48 *in situ* vertical profiles over approximately 6 weeks in May and June, 2016. Vertically resolved rBC mass in 50 hPa bins is shown for individual vertical profiles measured over Taehwa; colors indicate observations made during periods dominated by different synoptic scale meteorology.