Project AEROLIT (Aerosol in Lithuania): Investigation of primary-secondary and regional-local contributions to particulate matter in the south-eastern Baltic region

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Atmospheric aerosols have critical effects on human health and the global radiation balance. The magnitude of these effects remains largely unknown due to uncertainties in carbonaceous aerosol sources, transformations, and atmospheric lifetime. **AEROLIT** will provide long-term, comprehensive measurements of carbonaceous aerosol composition at urban, rural, and coastal sites in Lithuania.

AEROLIT couples state-of-the-art measurements (aerosol mass spectra, stable isotope ratio measurements, and organic molecular markers analysis) with source apportionment factor analysis techniques using the multilinear engine to provide a quantitative assessment of the factors affecting Lithuanian air quality. Measurements will be simultaneously performed at coastal, rural, and urban sites. The **AEROLIT** project consists of five Work Packages (WPs) that will be completed over the study period (Fig. 1):

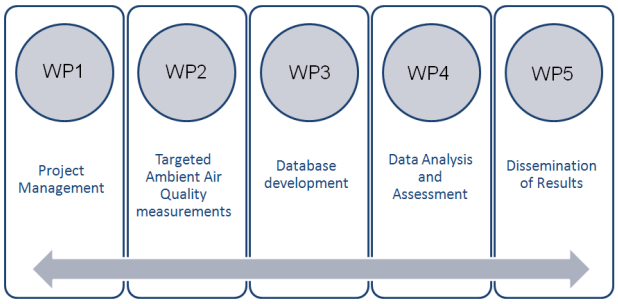

Figure 1. Research associated work plan.

The principal measurements to be performed are:

a) Long-term online aerosol mass spectrometry using an aerosol chemical speciation monitor (ACSM) and a quadrupole aerosol mass spectrometer (Q-AMS).

b) Long-term filter sampling with a High-Vol sampler at 3 sites: Offline analysis of aerosol collected on filters using high-resolution aerosol mass spectrometry (HR-AMS), the new compound-specific TAG-AMS (thermal desorption aerosol gas chromatography-AMS) technique (Williams *et al*, 2006) and isotope-ratio mass spectrometry (IR-MS).

c) Optical measurements of black carbon (BC) using a 7-wavelength aethalometer.

d) A subset of the filters collected in (b) will be analyzed for ^{14}C (modern/fossil carbon) and monosaccharide anhydrides (tracers for biomass combustion).

An example of the **AEROLIT** approach is given in Figure 2, where a pilot study of a biomass burning pollution event from long-range transported aerosols was investigated.

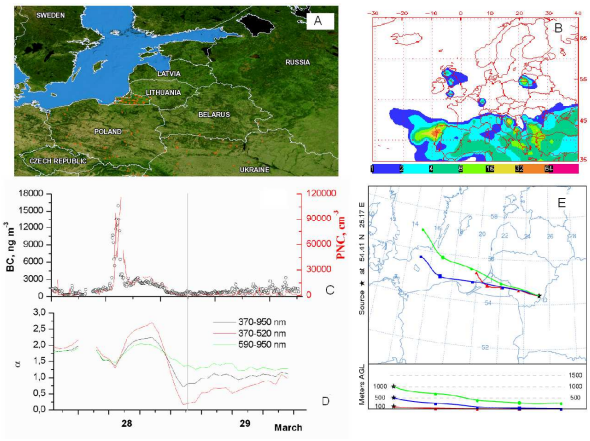

Figure 2. Active fires detected on 28-29 March, 2012 during high BC concentration event: (A) by the MODIS Rapid Response System, (B) NAAPS Smoke surface concentration (ng m^{-3}), (C,D) BC aerosol and particle number concentration and (E) 2-days air mass backward trajectories to Vilnius (at 100, 500 and 1000 m AGL) during the event of wildfires.

Previous results about aerosol source characterization in Lithuanian sites can be found in Garbariene *et al* (2012) and in Ulevicius *et al* (2010). **AEROLIT** brings together leading air quality and pollution researchers with the following goals:

- Identify and quantify the processes and sources governing spatial and temporal PM concentrations at urban, rural, and coastal locations in Lithuania.
- Classify and quantify carbonaceous aerosol in terms of emission mechanism (primary vs. secondary), source geography (local vs. regional vs. trans-national), and source/precursor class (natural vs. anthropogenic, modern vs. fossil carbon).
- Conduct targeted chemically resolved organic aerosol and related molecular-marker measurement campaigns in urban, rural and background sites for source apportionment.

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