Aerosol Lab

Atmospheric aerosols are tiny particles suspended in the air and ubiquitously present in atmosphere, and known to affect air quality, climate, and human health. Chemical and isotopic composition of atmospheric aerosols are studied at PRL to understand their sources, formation processes, transport and transformation, absorption characteristics, and removal processes, which help to understand their effects. Aerosol samples are often collected using high-volume air samplers on appropriate filters. These filters are used to analyse for various chemical constituents like elemental carbon (EC), organic carbon (OC), other constituents like ionic species and metals etc. This particular lab utilizes EC-OC analyser, a thermo-optical analyser, to measure EC and OC content in the aerosol samples. The sample is heated up to ~800°C in inert condition and the evolved components are oxidised to produce CO_2. This CO_2 is converted to CH_4 and measured quantitatively by flame ionisation detector. This carbon content is identified as OC. The remaining refractory fraction of carbon is heated again in presence of oxygen and measured with the same procedure. This fraction is identified as EC. But, during the heating process of organic fraction, some portion of carbon content may char and produce pyrolysed carbon (refractory in nature). So the OC will be underestimated and EC will be overestimated during this analysis. This problem is rectified using an optical correction. Water-soluble organic carbon (WSOC) in aerosol samples is measured using Total Organic Carbon analyser. To separate the soluble carbon species, the sample is leached with de-ionised water and filtered. This solution is treated with phosphoric acid to remove inorganic carbon content, and combusted at 760°C in presence of platinum catalyst in the TOC analyser to convert all carbon content to CO_2. This CO_2 is measured with a non-dispersive infrared (NDIR) detector. Gas chromatograph mass spectrometer (GC-MS) is used for the speciation of organic compounds present in OC. The carbonaceous aerosols constitute a major component of ambient aerosols with profound influence on environment, health, and climate.