

TRACKING BIOMASS BURNING AEROSOL: FROM THE COMBUSTION LABORATORY TO SUMMIT, GREENLAND

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Because of its potentially profound influences on tropospheric ozone formation, visibility and climate, there is increasing interest in tracking and quantifying sources of biomass burning aerosol, especially in cases of long range transport. Among the many potential tracers for combustion aerosol, ^{14}C is perhaps the most important because of its unique ability to apportion biomass and fossil carbon; and recent advances in accelerator mass spectrometry have made ^{14}C "dating" of remote carbonaceous aerosol practicable, as a result of its near microgram level sensitivity. Other tracers such as potassium, ammonium, elemental and organic carbon, and specific classes of organics, such as polycyclic aromatic hydrocarbons are also widely used because of economy and/or enhanced sensitivity. Such tracers, or molecular markers, however, provide indirect evidence of biomass (or fossil) burning aerosol, so one of the most vital applications of ^{14}C metrology is to assess the validity of such alternative tracers.

We shall report on a number of instances where ^{14}C validation (or non-validation) is playing a critical role in regional and remote field studies, such as the application of mineral-corrected potassium to urban woodburning soot apportionment, and the application of ammonium and ion balance data to the identification of biomass burning aerosol transported to Summit Greenland, and to the development of the biomass burning record from snowpit and ice core data. The latter work is in an early stage, but already we have observed correlation between greatly enhanced trace organics with potassium, ammonium, and an ion balance variable in a Summit Greenland air particulate sample collected on 5 August 1994. Also, previously reported back trajectories for this sample showed strong transport over biomass fires in northern Canada. Complementing this work, the 1995 season at Summit provided an opportunity to look for the August 1994 biomass burning signal in snow pits, and to search for ionic, organic and isotopic biomass burning signatures in 1995 surface snow and atmospheric aerosol collected directly on quartz filters. A progress report on this work will be presented, together with vital supporting laboratory work on the combustion process, and on the production of trace organic and isotopic standards for carbonaceous aerosol research. The former, combustion studies proved extremely important in showing the relationship between trace organic aerosol composition, fuel type, and combustion stage; the latter, which includes the development of a carbonaceous particle filter standard, is vital to control the quality of carbon measurements in the remote, polar (Arctic) region where aerosol carbon is in the mg/m^3 range, while its concentration in the snow and ice is of the order of ng/g .