Geophysical Research Abstracts
Vol. 15, EGU2013-8174, 2013
EGU General Assembly 2013

High temporal resolution measurements of biomass burning events during summertime in the Eastern Mediterranean.

Aikaterini Bougiatioti (1), Pavlos Zarmpas (1), Christina Theodosi (1), Iasonas Stavroulas (1), Giorgos Kouvarakis (1), Francesco Canonaco (2), Andre S.H. Prevot (2), Spyros N. Pandis (3), and Nikolaos Mihalopoulos (1)

(1) Environmental Chemical Processes Laboratory, University of Crete, Heraklion, Crete, Greece, (2) Laboratory of Atmospheric Chemistry, Paul Scherrer Institute, Villigen PSI, Switzerland, (3) Institute of Chemical Engineering Sciences (ICE-HT), FORTH, Patras, Greece

Several major wildfires occurred at the Greek islands of Chios, Euboea and Andros during the summer of 2012. The corresponding biomass burning-influenced air masses were studied at the remote background site of Finokalia, Crete. The smoke was transported several hundreds of kilometers, arriving at the measurement station after approximately half a day of atmospheric processing, mostly during night-time. The origin of air masses was confirmed by back-trajectory analyses and the chemical composition of the particulate matter was studied by different high-resolution measurements, including an Aerosol Chemical Speciation Monitor (ACSM), and a seven wavelengths aethalometer. Despite the distance between the islands and the travel time, a clear biomass burning profile containing characteristic markers could be derived from BC measurements and exploiting the statistical tool Multilinear Engine (ME-2).

During these events aerosol particles contained a noteworthy amount of black carbon, ranging from 2.8 up to 5 μg m-3, which exceeds typical background values by a factor of 8 or more. Simultaneously organic matter concentrations increased significantly. In the case of the island of Chios fires the fine PM levels exceeded background values by a factor of 4 ranging from 2.9 to11.6 μg m-3.

PMF is a statistical tool used to deconvolve the organic aerosol spectral matrix measured by the Aerosol Chemical Speciation Monitor (ACSM), resulting in a number of components/factors that are a posteriori validated as possible sources. A successful unconstrained run (PMF) within the Multilinear Engine (ME-2) over the fire events only, lead to a clear biomass burning profile which correlates well with reference biomass burning spectra (R2=0.9). The model was rerun over the entire period by constraining this biomass burning profile and the fire events were all well-represented. More than 70% of the measured OA is “aged”, oxidized organic aerosol, which correlates well with reference OOA spectra (R2=95%). Even if often the smoke was mainly transported overnight, half a day of travel was sufficient for the transformation of freshly-emitted BBOA to more oxidized OOA in the very oxidizing environment of the Eastern Mediterranean.