MIXTURES OF BIOMASS-BURNING AND URBAN AEROSOLS ANALYSIS: A CASE STUDY.

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Iasi is a municipality from North-Eastern part of Romania and one of the largest cities in the country. Being a city in continuous development, several urban projects were started in the spring of 2012, with the purpose of improving the city’s infrastructure and restoration of some cultural buildings and parks.

Urban and industrial aerosols type is a major component of the tropospheric aerosol load over IASI LOA-SL site monitoring station (47N, 27E). This study presents the results from optical properties analysis (from May 2012 to February 2013 period) on biomass-burning and urban aerosols mixtures by means of lidar and sun-photometer measurements.

In order to both identify and categorize the biomass burning types influences, Aerosol Robotic Network (AERONET) Version 2 data criteria (Level 1.5, solar zenith angle larger than 50^{o} and retrieval error less than 5%) have been used to compute parameters such as: optical thickness, spectral dependence of Ångström exponent (α), spectral dependence of Single Scattering Albedo and the dominating size mode. Both biomass burning and urban-industrial aerosols are characterized by very small particles, so that fine mode is predominating in the particle size distribution.

The decreasing of Single Scattering Albedo’s total average with the increasing of the wavelength (440, 675, 870, 1020 nm) from 0.95 (± 0.1) to 0.81 (± 0.1) agree on dominant aerosol type (Fig. 1).

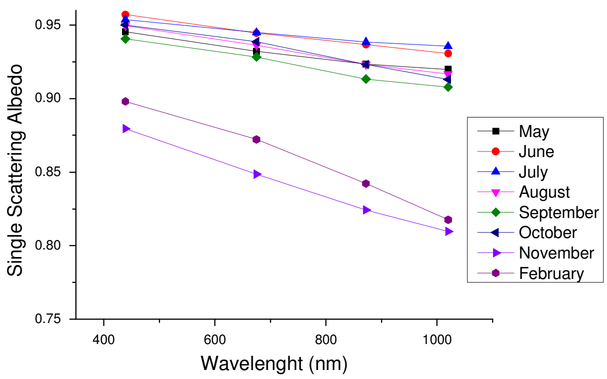

Fig. 1 Spectral single scattering albedo, monthly averages.

The lidar ratio has been calculated from both AERONET inversion and Fernald – Klett inversion (Nicolae et al., 2008). Single Scattering Albedo, Phase Function and Aerosol Optical Thickness were used to determine the lidar ratio and the extinction coefficient. An event on 5 July, 2012 shows that the AERONET lidar ratio calculated at 532 nm (S_{532aer}) is between 55~75 sr with an Ångström exponent between 1.3~1.7 for urban/industrial aerosol and 1.6~1.9 for biomass burning. The lidar measurements were performed by a mini-lidar system described in details in previous papers (Cazacu et al, 2012), developed in the framework of ROmanian LIdar NETwork (ROLINET) and RADO (Romanian Atmospheric Research 3D Observatory) research projects. The values of lidar-lidar ratio (S532) were in the range of 41 ~ 70 sr.

Furthermore, a good method to determine the dominating aerosol type is a/the correlation between the Absorption Ångström exponent (440 – 870 nm) and the Extinction Ångström exponent (440 – 870 nm). Aerosol absorption provides uncertainties in determining the dominance of aerosol types, while applying an aerosol particle size parameter (e.g., Extinction Ångström exponent at 440 – 870 nm) to separate larger particles, improves this method. (Giles et al., 2012; Russell et al., 2010).

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