Geophysical Research Abstracts
Vol. 20, EGU2018-17138, 2018
EGU General Assembly 2018

Anthropogenic primary fine aerosols dominate the wintertime regime over the northern Indian Ocean

Krishnakant Budhavant (1,2,3), Srinivas Bikkina (1), August Andersson (1), Eija Asmi (4), John Backman (4), Jutta Kesti (4), Hameed Zahid (3), Sreedharan Krishnakumari Satheesh (2), and Örjan Gustafsson (1)

(1) Stockholm University, Department of Environmental Science and Analytical Chemistry, Sweden (kbbudhavant@gmail.com), (2) Centre for Atmospheric and Oceanic Sciences (CAOS), and the Divecha Centre for Climate Change (DCCC), Indian Institute of Science, Bangalore, India , (3) Maldives Climate Observatory-Hanimaadhoo, Maldives Meteorological Services, Maldives , (4) Finnish Meteorological Institute, Helsinki, Finland

Here we present and evaluate extensive observations on the aerosol mass concentration, number-size distribution, aerosol major-ion and carbon-species chemical composition, aerosol optical depth (AOD), and carbon monoxide, from the Maldives Climate Observatory in Hanimaadhoo (MCOH) for the period of November 2014 to April 2015. Cluster analysis of air-mass back trajectories for MCOH, combined with AOD and meteorological data, demonstrate that the northern Indian Ocean is strongly influenced in this season by aerosols transported from source regions with three major wind regimes, originating from the Indo-Gangetic Plain (IGP), Bay of Bengal (BoB) and Arabian Sea. In the total PM10, 97 $\pm$ 3% of elemental carbon (EC) was found in the fine mode (PM2.5). Other mainly anthropogenic constituents such as organic carbon (OC), non-sea-salt (nss) -K+, nss-SO42- and NH4+ were also predominantly in the fine mode (70-95%), particularly in the air masses from IGP. The combination at this large-footprint receptor observatory of consistently low OC/EC ratio (2.0 $\pm$ 0.5), strong linear relationships between EC and OC as well as between nss-K+ and both OC and EC, suggest a predominance of a common primary source, with a large biomass burning contribution. The particle number-size distributions for the air masses from IGP and BoB exhibited a clear bimodal shape within the fine fraction with distinct accumulation (0.1 μm < d < 1 μm) and Aitken (25 nm < d < 100 nm) modes. This study also supports that IGP is a key source region for the wider South Asia and nearby oceans, as defined by the criteria that anthropogenic AODs exceed 0.3 and absorption AOD > 0.03. Taken together, the aerosol pollution over the northern Indian Ocean in the dry season is dominated by a well-mixed long-range transported aerosol regime of largely primary combustion origin.