Geophysical Research Abstracts
Vol. 13, EGU2011-1088-2, 2011
EGU General Assembly 2011

Characterization and Source Apportions of Local and Foreign PM2.5 in the Middle East under Different Synoptic Conditions

Nivi Kessler (1), Ofir Tirosh (2), Uri Dayan (3), Shimshon Belkin (1), James Schauer (4), and Yigal Erel (2)

(1) Institute of Life Sciences, The Hebrew University of Jerusalem, Jerusalem, Israel, (2) Institute of Earth Sciences, The Hebrew University of Jerusalem, Jerusalem, Israel, (3) The Department of geography, The Hebrew University of Jerusalem, Jerusalem, Israel, (4) Civil and Environmental Engineering Department, University of Wisconsin-Madison, Madison, USA

Numerous studies have demonstrated that elevated concentrations of suspended atmospheric particles (PM) are associated with adverse health effects including oxidative stress, respiratory and cardiopulmonary diseases, oxidative DNA damage, and have important impacts on the general population and sensitive individuals including children, pregnant women and elderly people. Increasing evidence suggests that exposures to fine particles (less than 2.5 or even less than 1 micrometer) are associated with the largest health risk compared to coarse particles. Likewise, the type of particles, their composition, and the amount of toxic components present in the particles have an important impact on the health outcome of an exposed human population. Given the need to reduce the public's risk to ambient PM exposure, an accurate assessment of relative impact of different sources, including long-range transboundary transport is greatly needed.

The current study aims to combine meteorological analysis with air pollution in order to classify air pollution sources and composition to provide a cost effective metric for use in epidemiological studies. The project relies on a close link between synoptic and back trajectory analyses and chemical and statistical analyses of aerosols. Aerosols were sampled in several urban centers in Israel and underwent advanced chemical analyses, which were directed by an analysis of synoptic conditions. Aerosol data was obtained from three sources: (1) Chemical analysis of the mineral fraction of $PM_{2.5}$ collected by the Ministry for Environmental Protection (MOE) and by Union of Municipalities for Environmental Quality between 2008 and 2010. (2) Collection of $PM_{2.5}$ with dedicated samplers in four urban centers during 2009-2010. These samplers allowed for a complete chemical characterization of $PM_{2.5}$ (mineral fraction, sulfates, nitrates, black carbon, elemental carbon, and selected organic compounds). (3) Statistical analysis of mass loadings obtained by the same monitoring stations during 2000 – 2010.

The data gathered by the present study, and the subsequent source attribution analyses, should serve as foundation for the development of control strategies and to design cost-effective location-specific health studies that can quantify the spatial distribution of exposure throughout Israel and the relative risk associated with the emissions from different sources. It should allow policy makers to determine and adjust emission standards for $PM_{2.5}$ in order to maintain acceptable exposure levels.