



Analysis of the Saharan dust transport to the Anatolian Peninsula: Megacity perspective

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The Saharan dust outbreaks, having considerable effect on radiative forcing and cloud, take place throughout the year and increase particulate matter (PM) air pollution all over the world. These events put additional stress over air quality management which is already under a serious amount of pressure due to rapid urbanization and industrialization. Therefore, it is critical to analyze the contribution of natural dust to PM levels in urban atmosphere.

Istanbul located on the Bosphorus strait, connecting Black Sea to Aegean Sea via Marmara Sea, is the largest megacity in the Mediterranean Basin with more than 13 million inhabitants. As in other megacities, Istanbul suffer from significant air pollution levels and citizens consider air pollution as one of the most important issues. Under certain weather conditions, unexpected poor air quality levels are observed in the city that is suspected to be transported from distant sources [1].

This study presents a comprehensive analysis of the springtime characteristics of dust transport to the Anatolian Peninsula, using observations, satellite data, and dust model results. Selected episodes of Saharan dust transport are analyzed using a meteorological model approach as well. The results suggest that Saharan dust transport has significant contributions to Istanbul's air pollution. Majority of the PM₁₀ exceedances (65% average for the spring period of 2004-2010) in Istanbul's urban monitoring stations are originated by African dust outbreaks. When the dust-loaded cyclones originating from Sahara, reached the furthestmost part of the Eastern Mediterranean (i.e. Akhdar, Libya); under certain conditions that depend on surface high pressure zone's intensity and location, they may not follow their usual path to Southeastern Mediterranean but rather are transported to the Anatolian peninsula. Analysis including observations, back-trajectory and modeling approach performed in the springtime period for seven years (2004 – 2010) for all Saharan dust outbreaks over the Eastern Mediterranean indicate, for the first time, a surface high pressure system located over eastern Mediterranean (often around Cyprus) has the most important role for dust transport to the Anatolian Peninsula.

This paper investigates the role of Saharan Dust advection in the unexpected high levels of PM observation over Eastern Mediterranean. For this purpose, in addition to an atmospheric model approach performed for specific episodes, a long-term weather conditions are also considered to get a comprehensive evaluation. It is suggested that the imposed European Union limits on PM cannot be applicable for the megacity of Istanbul unless the natural (present study) and anthropogenic [2] origin of the PM is taken into account.

[1] Kindap, 2008. "Identifying the Trans-Boundary Transport of Air Pollutants to the City of Istanbul Under Specific Weather Conditions", *Water Air & Soil Pollution*, 189, 279-289 (2008).

[2] Kindap et al., 2006. "Long-Range Aerosol Transport from Europe to Istanbul Turkey," *Atmospheric Environment*, 40, 3536-3547 (2006).