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On the origin and variability of suspended particulate matter (PM1, PM2.5 and PM10) concentrations in Cyprus.

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The Eastern Mediterranean (EM) lies at the crossroad of three different continents (Europe, Asia, and Africa). EM is a densely populated region including several cities with 3M inhabitants or more (e.g. Athens, Istanbul, Izmir, and Cairo). It has been identified as the most polluted area in Europe with respect to particulate matter (PM) mainly due to the combination of high photochemical activity, which causes pollutants to oxidize and partitioning in the particle phase, with the elevated pollutants emissions from neighboring regions. In addition, the proximity to Africa and the Middle East allows frequent transport of dust particles. At the center of the Eastern Mediterranean lies the island of Cyprus, which has received very little attention regarding its PM levels despite being the location in Europe most frequently impacted by air masses from the Middle East.

Herewith, we present a historical PM archive that spans 2 decades. It involves ongoing monitoring on a daily basis of particulate matter with diameters smaller than 10 μm (PM10), 2.5 μm (PM2.5), and 1 μm (PM1) conducted in at least one, of the 12 currently existing air quality stations in Cyprus since 1997, 2005, and 2009, respectively. The most extended PM datasets correspond a) to the Agia Marina Xyliatou (AMX) monitoring station established at a remote area at the foothills of mount Troodos and b) that of the inland capital, Nicosia.

Based on this long-term dataset, the diurnal, temporal and annual variability is assessed. Prior to 2010, PM10 concentration at all sites remained relatively constant, but at different levels, violating the annual EU legislated PM10 limit of 40 μg m-3. Since 2010, coarse mode levels have decreased at all sites. The reported decrease was equal to 30% at AMX. As a result, since 2010 the observed levels comply with the EU legislation threshold. Satellite observations of Aerosol Optical Thickness (AOT) Moderate Resolution Imaging Spectroradiometer (MODIS) onboard NASA's Terra satellite support this result, suggesting that it is not due to a systematic bias in the sampling procedure. The amount of dust regionally transported from both Sahara and Middle-East deserts exhibited an increasing trend from 1998 till 2010, resulting in an elevation of the coarse mode by 0.5 μg m-3 annually. However, during 2010 the contribution of regional dust to PM10 declined sharply (by 6.8 μg m-3), similar to the observed coarse mode trend and has remained at this reduced level since. However, PM1, mostly driven by anthropogenic emissions, remained constant at the regional background site of AMX.

Our results suggest a sharp decline in the coarse mode concentration since 2010 that cannot be attributed to local, anthropogenic, influence but rather to the unexpected decline in regional dust transport.