

Fine aerosol toxicity in urban environments of Eastern Mediterranean

D. Paraskevopoulou^{1,2}, K. Tavernaraki¹, I. M. Vrettou², M. Tsagkaraki¹, A. Bougiatioti² and N. Mihalopoulos^{1,2}

¹ECPL, Department of Chemistry, University of Crete, P.O. Box 2208, 71003 Heraklion, Greece

²IESRD, National Observatory of Athens, I. Metaxa and Vas. Pavlou, 15236, P. Penteli, Athens, Greece

In October 2022, the European Commission published a proposal for a revision of the Ambient Air Quality Directive. Stricter thresholds for pollution, more closely aligned with new limits set by the WHO and strengthened rules for air quality monitoring to support preventive action and targeted measures. One of the latter is monitoring of the Reactive Oxygen Species (ROS) contained in ambient aerosol. Although a direct mechanism linking PM exposure to health outcomes is not yet well established, it is believed that ROS (redox-active components, like metals and several organic species), present in polluted air or generated from photochemical reactions, can induce oxidative stress in human organism. During an intensive measurement campaign, daytime and nighttime PM_{2.5} samples were collected at the urban environment of Ioannina; a rural mountainous moderately-inhabited city (~0.15M inhabitants), impacted by intense residential wood burning (RWB) for heating purposes especially during winter night-time, that in combination with its topography, results in magnified accumulation of atmospheric pollutants. The oxidative potential of the collected samples was determined using a semi-automated system, applying the dithiothreitol (DTT) assay. It is worth noting that nighttime DTT values were 3 times higher than the daytime ones, highlighting the critical role of RWB in population exposure. Furthermore, measured OP levels were compared with carcinogenic markers such as polycyclic aromatic hydrocarbons (PAHs) and their oxygenated derivatives (OPAHs). All the aforementioned levels were also compared to the respective values from Athens, the capital of Greece with almost 4 million inhabitants, and from Heraklion, an urban center in Crete, with 0.2M inhabitants. The results elucidate the importance of regional aerosol transportation during the warmest period of the year, and the dominant impact of local sources in wintertime.