

Urban atmospheric pollution in the Eastern Mediterranean : lessons from the TRANSEMED initiative

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The East Mediterranean Basin (EMB) is a highly sensitive environment under considerable pressures. Future decadal projections point to the EMB as a possible hot spot of poor air quality and predict a continual and gradual warming in the region, much stronger than other regions. The increase and accumulation of anthropogenic emissions of gaseous and particulate pollutants from surrounding urban areas, are suspected as one of the key compounding factors of those environmental impacts. The quantification of emission distribution is a challenge, and even more in cities of the EMB where local emission data are sparse. While some highly resolved inventories have been developed at the regional scale in the EMB area for Beirut and Istanbul, their uncertainties are unknown. The paucity of observations in this region, especially for VOCs and PM composition, is a strong limitation to the achievement of evaluated and accurate emission inventories. As part of the TRANSEMED initiative (<https://charmex.lsce.ipsl.fr/index.php/sister-projects/transemmed.html>), one of our objectives is to develop a systematic source-receptor methodology for emission inventory evaluation. We combine existing and newly collected observations and complementary source-receptor approaches (ie., urban enhancement emission ratios, multivariate models like PMF) in representative areas of the EMB: Beirut (Lebanon), Istanbul (Turkey), Cairo (Egypt) and, more recently, Athens (Greece). Over the past five years a very detailed database of ambient and near-source observations has been built-up especially regarding the composition of gaseous organic carbon. Results show (i) the extremely high levels of pollution for organics, (ii) the dominance of traffic emissions on VOC concentration levels, (iii) the relative poor spatial variability of speciated hydrocarbon traffic emissions regardless of the region, and (iv) the high uncertainty on global emission inventories when compared to observations. For the latter, and from a global perspective, the relative importance of Eastern Mediterranean emissions is suspected to be largely underestimated compared to other regions worldwide: they could be as significant for VOC and NO_x as the ones of Europe and North America or even higher for $\text{PM}_{2.5}$.

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