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Real-time source apportionment of local vs regional dust in a semi-arid urban environment of the Eastern Mediterranean Middle East (EMME) region

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Major efforts are currently put to reduce drastically PM emissions at the exhaust of the most recent vehicles, however, little is done to mitigate non-tail-pipe emissions and resuspended road dust, in particular. Such traffic-related resuspension of dust may become a major source of PM10 at a time our cars are becoming cleaner. This may be particularly true in (semi-)arid urban environments which are characterized by high deposition rates of desert dust and low rain wash-out rates of roads.

Near-real-time (10-min time resolution) on-line measurement of selected cations (Na^+, Mg^{2+}, Ca^{2+}) in PM10 were performed using a Particle-into-liquid-sampler (PILS) coupled with an Ion Chromatograph (IC). Such high temporal resolution of these species has been rarely reported in literature and to the best of our knowledge, it is the first time that such dense observations are reported in PM10 for urban environment. These measurements were performed during a 3-month transition period between (from wet winter to dry summer) at an urban background site of Nicosia (Cyprus) a central location of the Eastern Mediterranean Middle East (EMME) region.

The consistency of these measurements was successfully assessed against 24-h integrated filter-based measurements while hypotheses related to the use of Calcium as a tracer of dust particles further verified against trace metal analysis. A comprehensive suite of co-located ancillary data (Aethalometer, Lidar, ACSM, SMPS, OPC) were used to further support the daily/weekly/monthly variability of Calcium concentration in PM10.

Diurnal variability of dust concentration in PM10 at our background urban site displayed a strong and intense traffic-related source at rush hours together with a maximum observed in the afternoon in phase with the development of the Planetary Boundary Layer and intrusion of desert dust from aloft. Interestingly, this pattern is amplified when moving from wet to dry months and encompassing the Spring dust season.

The contribution of the two dust sources in PM10 (traffic-related dust resuspension and intrusion of long-range transported desert dust) is provided here for different temporal scales (day, week, month). Estimate of traffic-related (non-)tail-pipe emissions (ie. combustion carbonaceous vs

resuspended dust) is also provided here highlighting the dominant role of dust in PM10 emissions from road transport sector.