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Regional versus Local Sources of aerosols over Cyprus

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Long term monitoring of PM concentrations in Cyprus reported the occurrence of a significant number of PM exceedances above the limits set by EU legislation and point out the need for abatement strategies. To address these critical issues, mass and chemical composition of daily PM10 aerosol samples were collected at a suburban (Limassol; LIM RES), a natural background site (EMEP site, Ayia Marina) and an urban center (Nicosia, NIC TRA) from January 2010 to December 2010.
By considering the chemical composition measured at EMEP as representative of the regional background, the contribution of local sources at both NIC TRA and LIM RES sites can be also estimated.
In total, "local" ions account for 1.7 and 2.4 μg m$-$3, i.e 33 and 48% of the total ionic mass recorded in NIC TRA and LIM RES. Sea salt attained levels of 2.3 $\pm$ 1.2 μg m-3, 1.9 $\pm$ 1.3 μg m-3 and 3.5 $\pm$ 2.3 μg m-3, contributing up to 10, 7 and 11% of the PM10 mass measured at EMEP, NIC TRA and LIM RES, respectively.
The local concentrations of OC and EC were equal to 3.3$\pm$1.1 μg m-3 and 3.2$\pm$1.3 μg m-3 for NIC TRA and 1.70$\pm$0.03 μg m-3 and 1.39$\pm$0.42 μg m-3 for LIM RES relative to the values measured at the EMEP site. The high EC concentrations in NIC TRA underline the major role of traffic-related emissions. As expected for the natural background site, OC/EC ratio equals 4.84, a strong indicator of secondary organic aerosol (SOA) formation. Whereas in the urban and suburban sites, the OC/EC ratio is lower ranging from 1.46 to 1.84, denoting significant influence from fossil fuel primary emissions in the studied areas.
Considering that dust at EMEP is due to "regional" dust, the dust measured at both traffic related sites is the sum of "regional" and "local dust", the second most probably originating from soil dust and car/road abrasion. The "local dust" at NIC TRA and LIM RES accounted for 28% and 21% of the total PM10 mass, whilst regional dust at EMEP of 45%. The temporal variation of "local dust" concentrations in NIC TRA and LIM RES reveal higher levels during the cold season, following nicely combustion tracers (EC) and prevailing weather conditions (low mixing layer), favouring road dust re-suspension.
Overall, the relative local contribution of the ionic mass, dust, POM and EC for NIC TRA and LIM RES varies from 3-23%, 52-54%, 18-27% and 7-13%, respectively. Thus, local dust is a major component of the total mass accounting more50% of the PM10 mass. Finally local ionic mass, accounts for a minor part of the PM10 mass.