

Variability of Ozone, OX and NO_x in Rural and Urban Areas in Marmara Region of Turkey

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Marmara region is located in northwest of Turkey and it is bordered by Greece and the Aegean Sea to the west, and Bulgaria, the Black Sea to the north covers about 11,000 km². Sea of Marmara is located at the center of the region. The region has the largest population in Turkey with about 23 million inhabitants. It is Turkey's main industrial region and It is the territory which is provided by a quarter of the Turkish economy. Moreover, the region is economically the most developed area of Turkey. Its agricultural potential is very rich. For example, about 73% of the sunflower production and 30 % of corn production of Turkey is done in this region.

The aim of the study is to assess the spatial and temporal variations in O₃, NO, and NO₂ in Marmara region of Turkey based on the analysis of hourly concentrations collected at 22 monitoring stations (7 rural and 15 urban) over three years (2013-2016). This is the first study in the region. In this way possible reasons of the results will be useful in the design of control strategies for photochemical pollution in this region.

For this purpose, diurnal variations of NO_x, O₃ and OX were examined for rural and urban sites. The total levels of oxidant (OX) which are considered to be sum of O₃ and NO₂ were determined. In rural sites, NO_x concentrations are generally lower than at urban and polluted sites of Marmara region. We found that usually O₃ peak time in rural areas are occurred at around 15:00 LST while mean peak values vary between 70-85 µg/m³. The highest mean concentrations of NO were also observed at 09:00 LST around 35-50 µg/m³ in rural areas while varies at the highest at around 75-85 µg/m³ in polluted sites. Due to the NO_x -dependent contribution corresponds to local production of ozone and the NO_x -independent contribution corresponds to regional concentrations, we examined OX versus NO_x for daytime (10:00-18:00LST) and nighttime (19:00-09:00LST) periods to understand the contaminants of NO_x from local sources or regional contribution in the region. We found that total OX appears to increase linearly with NO_x in rural sites.

Moreover, 3-day isentropic HYSPLIT back-trajectory analysis ending at 500m agl for ozone season are analyzed for the ozone season (1st May to 30th September). In the presented study, the prevailing mesoscale meteorological conditions occurring during ozone season over the Marmara region are examined from the reanalysis data of NOAA ESRL.

Finally, AOT40 index under EU ozone Directive are examined for vegetation and forest areas in Marmara region.