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Pollution events over the East Mediterranean : Synergistic use of GOME, ground based and sonde observations and models

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Retrievals of trace gas columns of O_3, NO_2 and HCHO from the measurements of backscattered radiation by GOME (Global Ozone Monitoring Experiment), interannual comparisons and comparisons with Systeme d'Analyse par Observation Zenithale (SAOZ), balloon and LIDAR measurements show that the East Mediterranean in spring, and particularly in May 1999 during the international PAUR II campaign in Crete, is influenced normally by back ground conditions but also by biogenic emissions and urban pollution related to distinct changes in wind direction between north and south. When following air masses along the trajectory we derived that air masses transported from N-NW (North-North-West) Europe towards the Mediterranean region are associated with an increase of tropospheric amounts of NO_2 by a factor of 1.4 to 1.5 and of HCHO by a factor of 1.6 to 1.8 as can be seen from GOME. Box model calculations show that such an increase of tropospheric amounts of NO_2 and HCHO column enhanced the tropospheric O_3 columns by only 1-2 DU per day locally. In addition to that backward trajectories emerging Crete were calculated to analyse the amount of 11-19 DU from the intrusion of stratospheric air masses into the troposphere during May 1999. As follows the long-range transport of O_3rich air masses and its precursors from industrial areas towards the Mediterranean region as well as stratospheric-tropospheric-exchange (STE) contribute mainly to enhanced tropospheric O_3 levels both at the ground and in the free troposphere.