6.045 Eastern Mediterranean transport patterns and atmospheric conditions associated with high and low summer ozone levels in the lower troposphere and the boundary layer.

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Abstract:

Vertical summertime ozone profiles measured within the MOZAIC project (1994–2008) over the Eastern Mediterranean airports of Cairo and Tel-Aviv were analyzed. Summer profiles during days with very high or very low ozone mixing ratios in the lower troposphere (1.5-5 km) have been examined together with the average profiles of relative humidity, carbon monoxide, temperature, wind speed and the corresponding composite maps of geopotential heights at 850 hPa. Also, profiles corresponding, respectively, to the highest and the lowest ozone mixing ratios for the 0-1.5 km layer over Cairo are examined along with their corresponding composite maps of the following meteorological parameters (and/or their anomalies): geopotential height, vertical velocity, specific humidity, columnar precipitable water, air temperature and wind speed at 850 hPa as well as the corresponding backward trajectories.
The principal result of this study is that the lower-tropospheric ozone variability over the eastern Mediterranean is controlled mainly by the synoptic meteorological conditions. In particular, the highest ozone concentrations in the lower troposphere and the boundary layer are associated with large-scale subsidence of ozone-rich air masses from the upper troposphere under anticyclonic conditions while the lowest ozone concentrations are associated with low pressure conditions inducing uplifting of boundary-layer air, poor in ozone and rich in relative humidity, to the lower troposphere (Kalabokas et al, ACP, 2013). Also, during the highest ozone days at the 0-1.5km layer over Cairo, very high ozone concentrations around 80 ppb are observed from the surface up to 4-5 km altitude associated with extended geographical areas of strong subsidence and dry conditions over the eastern Mediterranean as well as over eastern and northern Europe under northerly flow (Kalabokas et al, TellusB, 2015), which in addition to the photochemical ozone production under the favorable Mediterranean summer conditions leads to high

summer surface ozone background levels.