6.211 An investigation on the origin of regional spring time ozone episodes in the Western Mediterranean and Central Europe.

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Abstract:

For the identification of regional spring time ozone episodes, rural EMEP ozone measurements from countries surrounding the Western Mediterranean (Spain, France, Switzerland, Italy, Malta) have been examined with emphasis on periods of high ozone, according to the daily variation of the afternoon (12:00 – 18:00) ozone. For two selected high ozone episodes in April-May 2008, composite NCEP/NCAR reanalysis maps of various meteorological parameters and/or their anomalies (geopotential height, specific humidity, vertical velocity omega, vector wind speed and temperature) at various tropospheric pressure levels have been examined together with the corresponding satellite IASI ozone measurements (at 3 and 10 km), CHIMERE simulations, vertical ozone soundings and HYSPLIT back trajectories.
The results show that high surface ozone is measured at several countries simultaneously over several days. Also, the examined spring ozone episodes in Western Mediterranean and Central Europe are linked to synoptic meteorological conditions very similar to those recently observed in summertime ozone episodes over the Eastern Mediterranean (Kalabokas et al., ACP, 2013; Doche et al., ACP, 2014; Kalabokas et al., TellusB, 2015), where the transport of tropospheric ozone-rich air masses through atmospheric subsidence influences significantly the boundary layer and surface ozone concentrations.

In particular, the geographic areas with observed tropospheric subsidence seem to be the transition regions between high pressure and low pressure systems. During surface ozone episodes, strong gradients of geopotential height and temperature are observed, together with high positive omega vertical velocity (downward transport) and low specific humidity (dry conditions), at all examined pressure levels below 500 hPa. IASI satellite measurements show extended areas of high tropospheric ozone over the adjacent to the anticyclones low pressure systems, which influence significantly the boundary layer and surface ozone concentrations within the anticyclones by subsidence and advection, in addition to the photochemically produced ozone, resulting to exceedances of the 60 ppb standard.