Geophysical Research Abstracts
Vol. 13, EGU2011-11415, 2011
EGU General Assembly 2011

The Mediterranean summertime ozone maximum: A satellite and model perspective

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The Mediterranean troposphere exhibits a marked and localised summertime ozone maximum, with mean boundary layer concentrations exceeding 80 ppbv, which has the potential to strongly impact regional air quality and radiative forcing. The Mediterranean basin is influenced by a range of ozone precursor sources in the summer, including anthropogenic emissions, wildfires and biogenic emissions. In addition, the region can be perturbed by long-range pollution import from Northern Europe, North America and Asia. Understanding contributions from these different sources to Mediterranean ozone is critical for prediction of future European air quality and climate.

In this study, we exploit 5 years of tropospheric ozone profile observations from the Tropospheric Emission Spectrometer (TES) satellite instrument to evaluate the summertime Mediterranean ozone maximum. Unlike aircraft observations TES is able to provide multi-annual ozone profile information over the whole of the Mediterranean region. We investigate the ability of a state-of-the-art global 3D chemical transport model (TOMCAT) to represent the observed ozone concentrations, and use the model and Lagrangian air mass trajectories to determine their origins. We quantify contributions from anthropogenic and natural emission sources to the observed ozone enhancements. Our results will allow improved understanding of the large-scale processes controlling air quality and climate in the region of the Mediterranean basin.