A COMPARISON OF TROPOSPHERIC CONCENTRATIONS OF CO DURING THE MINOS CAMPAIGN WITH A 14-YEAR CO CLIMATOLOGY USING THE ECHAM5 GLOBAL CIRCULATION MODEL

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In this study we provide a comparison of the CO concentration fields during the MINOS campaign with a 14-year CO climatology. The MINOS campaign took place over Crete during the summer of 2001 with flight and ground measurements of several chemical constituents, aiming at a characterization of the summertime chemical structure over the Eastern Mediterranean region. We have used the ECHAM5 GCM at 2.8ox2.8o horizontal resolution, with 19 levels in the vertical direction extending from the surface up to 10hPa and with prescribed OH fields in order to describe CO chemistry. CO in the model has been tagged according to its sources so it was possible to examine its origins and transport patterns. The meteorological situation over the East Mediterranean area in the summer is characterized by strong NNE surface winds (etesians) caused by the combination with the Azores high pressure system with the Anatolian plateau low pressure system. A disturbed situation occurs when the etesians decline in strength and a more westerly flow pattern is established, when for example, a cut-off low is formed west of Crete more upstream. The modeling study has revealed that in the low troposphere, higher CO mixing ratios (up to 240ppbv) are recorded when there is a blocking/ weakening of the typical etesian wind circulation, followed by an establishment of a westerly flow, transporting polluted air masses, rich in anthropogenic CO from NW Europe. When etesians prevail, CO concentrations reach lower values (about 150ppbv) with the main source contribution being
from NE Europe. Locally produced CO from methane oxidation is important when no significant advection from remote sources is apparent. In the upper troposphere, the contribution from biomass burning regions in S. Asia is the dominant source of pollution, especially when the monsoonal circulation is strong and pronounced reaching East Mediterranean. In such cases, biomass burning air, rich in CO, is pumped into the upper troposphere due to the monsoonal convective activity in S.Asia and then transported by the easterlies prevailing in high altitudes to North Africa and the Mediterranean. This study seeks to determine whether these conditions are typical for the Mediterranean summer or whether the 2001 was an exceptional case in terms of CO concentrations and to what extend. For this reason a 14-year model run extending from 1980-1993 has been performed in addition to the MINOS period 2001 run, to help provide an insight on the MINOS period CO deviations from other years.