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A modelling study of air pollution in Beirut city for the summer of 2011.

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Beirut, the capital city of Lebanon which is located on the eastern shore of the Mediterranean basin experiences high pollution episodes. Annual average concentrations of coarse and fine particulate matter (PM) as well as nitrogen dioxide (NO_2) often exceed the World Health Organisation (WHO) recommended values. Therefore, improving air quality in this region is essential. In this work, the Polyphemus/Polair3D modelling system was used to investigate air pollution episodes in Beirut during 2-17 July 2011 to develop better understanding of air pollution in the city and its suburbs. This work will help in developing optimal emission reduction strategies for decreasing air pollution levels. The modeling domain covered two nested grids of 1 and 5 km resolution, respectively. The emission inventory was developed in a previous step of this work with a resolution of 1 km for Beirut and 5 km for the rest of the country (Waked et al., Atmos.Environ, in press). The Weather and Research Forecast (WRF) model was used to generate the meteorological fields and the Model of Emissions of Gases and Aerosols from Nature (MEGAN) was used for biogenic emissions. The results of the study are compared to measurements from a field campaign conducted in the suburb of Beirut during 2-17 July as a part of the Emission and Chemistry of Organic Carbon in East Mediterranean Beirut (ECOCEM-Beirut) project. The model reproduces well the concentrations of carbon monoxide (CO), PM10 and PM2.5 particulate matter but tends to overpredict the concentrations of nitrogen dioxide (NO_2) and ozone (O_3). The relative influence of chemistry and transport on air quality at the site is discussed.