



Simulating gas and particulate pollution over the Middle East and the state of Qatar using a 3-D regional air quality modeling system

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The rapid urbanization, industrialization and economic expansion in the Middle East have led to increased levels of atmospheric pollution with important implications for human health and climate. We applied the online-coupled meteorological and chemical transport Weather Research and Forecasting/Chemistry (WRF-Chem) model over the Middle Eastern domain, to simulate the concentration of gas and aerosols with a special focus over the state of Qatar. WRF-Chem was set to simulate pollutant concentrations along with the meteorology–chemistry interactions through the related direct, indirect and semi-direct feedback mechanisms. A triple-nested domain configuration was used with a high grid resolution (1x1 km²) over the region of Qatar.

Model predictions are evaluated against intensive measurements of meteorological parameters (temperature, relative humidity and wind speed) as well as ozone and particulate matter taken from various measurement stations throughout Doha, Qatar during summer 2015. The ability of the model to capture the temporal and spatial variability of the observations is assessed and possible reasons for the model bias are explored through sensitivity tests. Emissions of both fine and coarse mode particles from construction activities in large urban Middle Eastern environments comprise a major pollution source that is unaccounted for in emission inventories used so far in large scale models for this part of the world.