



Effect of MERRA-2 initial and boundary conditions on WRF-Chem aerosol simulations over the Arabian Peninsula

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In this study, we test the sensitivity of the horizontal and vertical distributions of aerosols to the initial and boundary conditions (IC&BC) of the aerosol/chemistry. We use the WRF-Chem model configured over the Arabian Peninsula to study both dust and anthropogenic aerosols. Currently, in the WRF-Chem the aerosol/chemistry IC&BC are constructed using either default aerosol/chemistry profiles with no inflow of aerosols and chemicals through the lateral boundaries or using the aerosol/chemistry fields from MOZART, the model for ozone and related chemical tracers from the NCAR. Here, we construct aerosol/chemistry IC&BC using MERRA-2 output. MERRA-2 is a recently developed reanalysis that assimilates ground-based and satellite observations to provide the improved distributions of aerosols and chemical species. We ran WRF-Chem simulations for July-August 2015 using GOCART/AFWA dust emission and GOCART aerosol schemes. We used the EDGAR HTAP V4 dataset to calculate SO₂ emissions. Comparison of three runs initiated using the same ERA-Interim reanalysis fields but different aerosol/chemistry IC&BC (default WRF-Chem, MOZART, and MERRA-2) with AERONET, Micropulse Lidar, Balloon, and satellite observations shows that the MERRA-2 IC&BC are superior.