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A Case Study On the Relative Influence of Free Tropospheric Subsidence, Long Range Transport and Local Production in Modulating Ozone Concentrations over Qatar

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The Qatar Environment and Energy Research Institute (QEERI) operates a network of air quality monitoring stations (AQMS) around the Doha metropolitan area and an ozonesonde station with regular weekly launches and occasional higher frequency launch experiments (HFLE). Six ozonesondes were launched at 0700 LT/0400 UTC and 1300 LT/1000 UTC over a three day period between 10-12 September, 2013.
We present the analysis of the ozonesonde data coupled with regional chemical transport modeling over the same time period using WRF-Chem validated against both the ozonesonde and surface AQMS measurements. The HFLE and modeling show evidence of both subsidence and transboundary transport of ozone during the study period, coupled with a strong sea breeze circulation on the 11th of September resulting in elevated ozone concentrations throughout the boundary layer.
The development of the sea breeze during the course of the day and influence of the early morning residual layer versus daytime production is quantified. The almost complete titration of ozone in the morning hours of 11 September, 2013 is attributed to local vehicular emissions of NO_x and stable atmospheric conditions prevailing over the Doha area. The relative contribution of long range transport of ozone along the Arabian Gulf coast and local urban emissions are discussed.