Figure S1. Scatterplots comparing observationally-constrained F0AM model PO₃ and the predictions based on the DNN for the whole data (test+validation+training) from each air quality campaign. "All" denotes all test data.
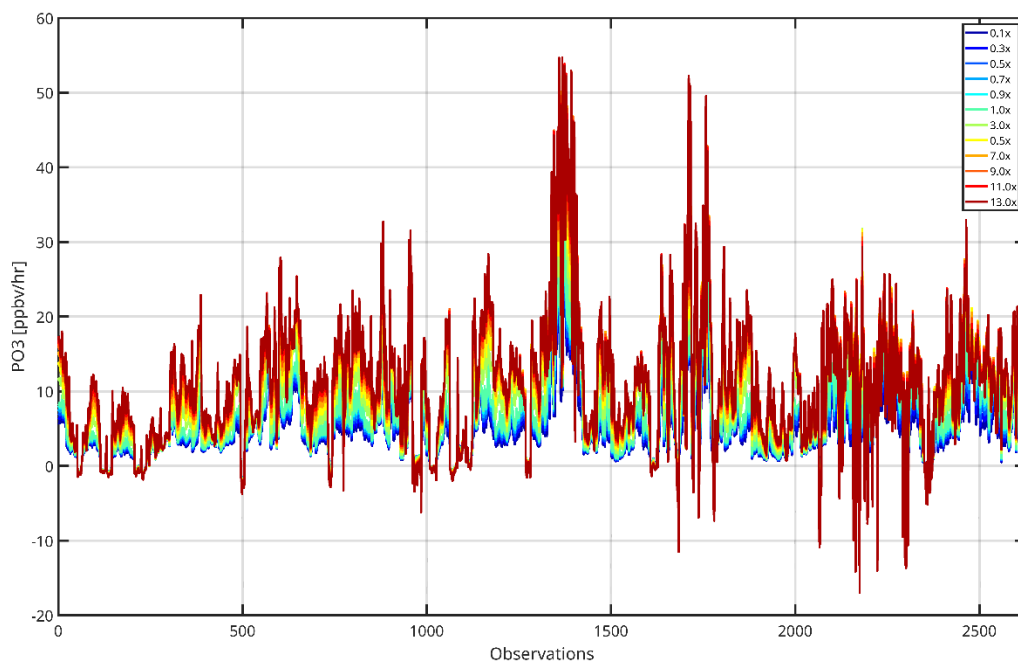
Figure S2. The effect of $H_2O(v)$ on PO_3 during KORUS-AQ campaigns. Only highly polluted regions ($HCHO \times NO_2 > 10$) are selected for this experiment.
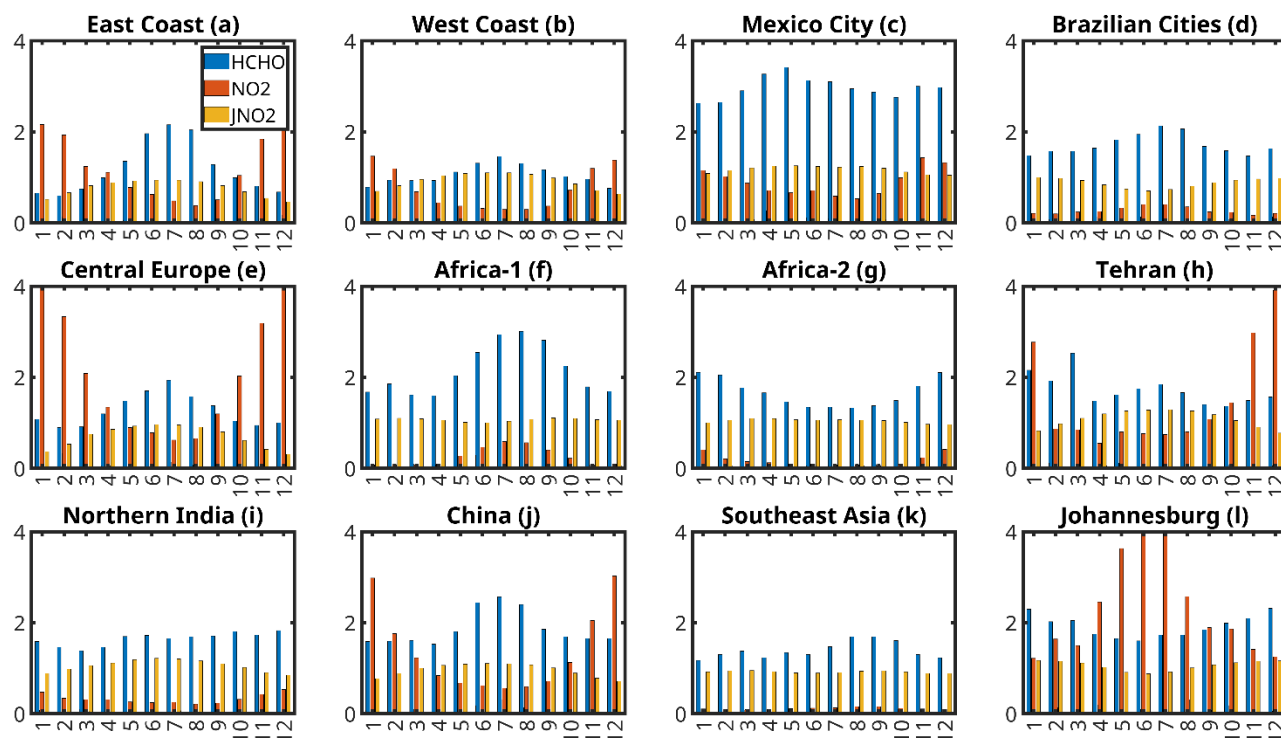
Figure S3. Absolute values of HCHO, NO_2, and jNO_2 for several regions shown in Figure 7 in the main manuscript. These data are based on 2005-2007 time period. HCHO and NO_2 units are ppbv. jNO_2 is in 1×10^3/s unit.