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Emerging Patterns of O_3 Sensitivity to CO over Megacities Derived from Satellite Retrievals

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The availability of long term multispecies retrievals offers an opportunity to study spatiotemporal patterns of atmospheric composition, especially over large anthropogenic pollution regions. Here, we jointly analyze IASI retrievals of O_3 and CO (along with OMI NO_2) to explore additional observational constraints on anthropogenic pollution. In particular, we estimate the trends of the enhancement ratios derived from IASI O_3 and CO and OMI NO_2 over major combustion regions in China and United States. Our results show intriguing differences of dO_3/dCO across Chinese megacities. In particular, Beijing and Shenzhen shows a positive linear trend (0.58$\pm$2.15 and 0.38$\pm$0.42 %/yr respectively) while Shanghai shows a negative trend (-062$\pm$0.67%/yr). This may be attributed to differences in VOC-NO_x-O_3 regime between these cities, which predictive models of atmospheric composition should be able to capture. On the other hand, enhancements of O_3 derived from these ratios show a pattern of decreasing to increasing trend across Beijing, Shanghai, and Shenzhen which may indicate differences in combustion-related activity between these cities consistent with the developing economic status of these cities. We suggest further evaluation against other datasets (ground- based, airborne, or other retrievals) to enhance the rigor of these findings. Nevertheless, this study offers an impetus towards characterizing other species relationships (e.g., IASI NH3, CH4, CO_2) not only as basis for monitoring consistency in atmospheric composition but also as a way to fully utilize the information content of these retrieval products in the context of data assimilation and reanalysis.