Figure S1. 18 Air Quality Monitoring Station (AQMS) and 1 supersite (Cape D'Aguilar Supersite (CDSS) at Hok Tsui) from HKEPD. Three roadside sites, including Mong Kok, Central, Causeway Bay, are denoted as triangles. Background sites include Tap Mun and Hok Tsui. Red color represents sites with volatile organic compound (VOC) measurements.

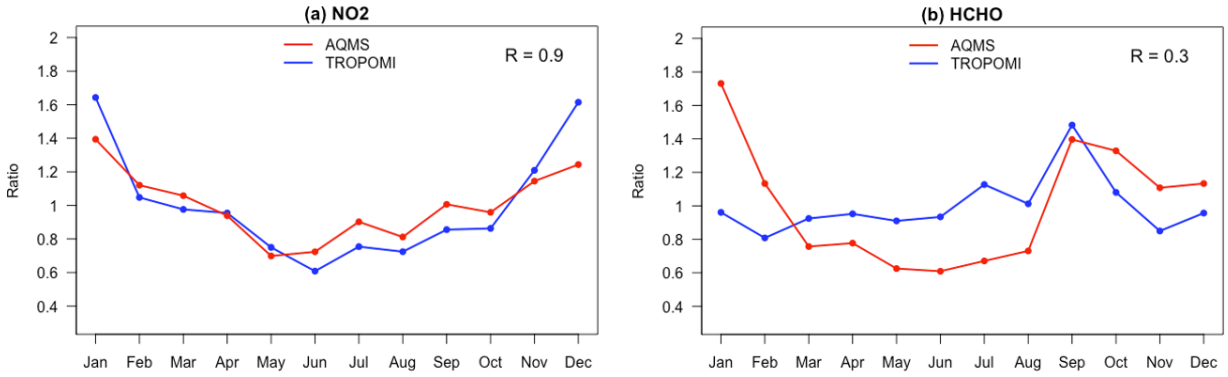

Figure S2. Monthly variations of (a) NO2 and (b) HCHO recorded by surface land-based AQMS sites and spaceborne TROPOMI during 2021–2022. Measurements from AQMS and TROPOMI were normalized using their respective annual mean.

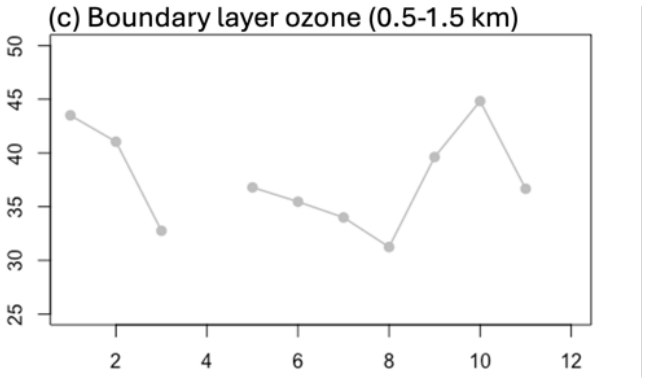

Figure S3. Monthly variations of boundary layer ozone, averaged from 0.5–1.5 km aloft, recorded by the ozone lidar at the Hok Tsui site in Hong Kong during 2021–2022.

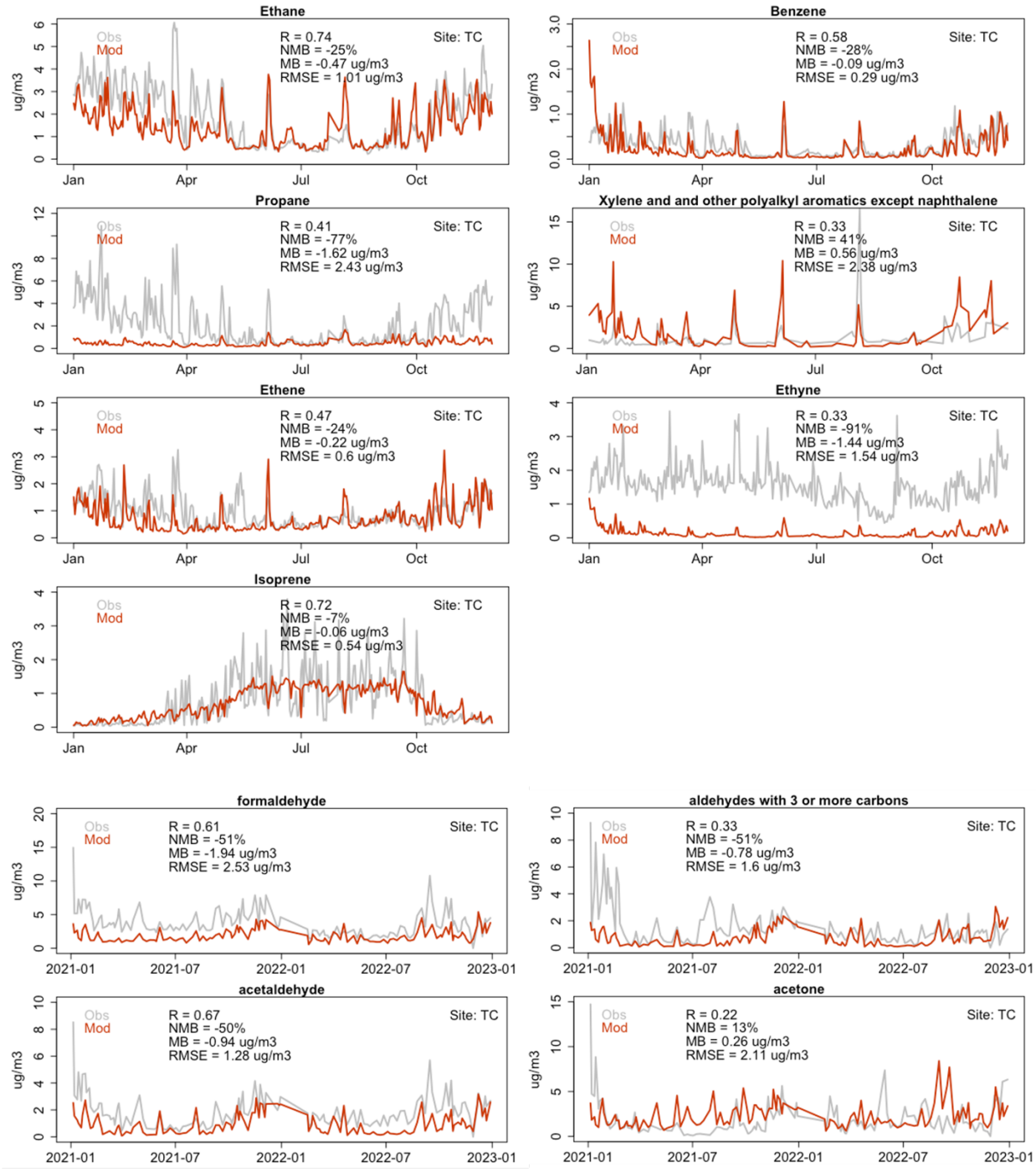

Figure S4. NMHC and OVOC observations at the Tung Chung site compared to the CMAQ model.

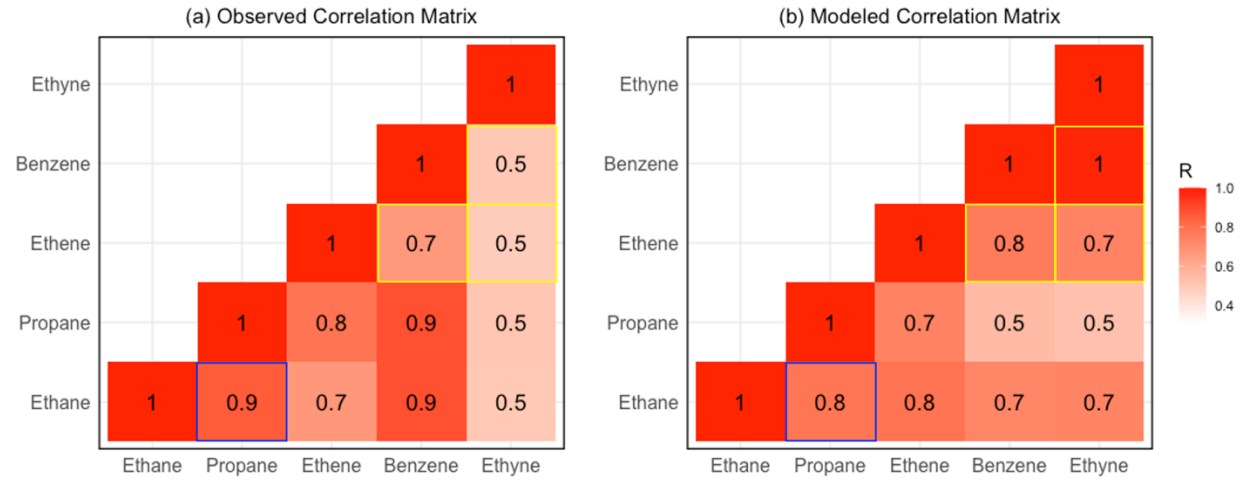

Figure S5. Correlation matrix for anthropogenic NMHCs at the Tung Chung site. Blue boxes indicate that the model accurately represents the strong correlation between co-emitted propane and ethane. Yellow boxes highlight discrepancies between the observed and modeled correlations of ethyne with ethene and benzene.

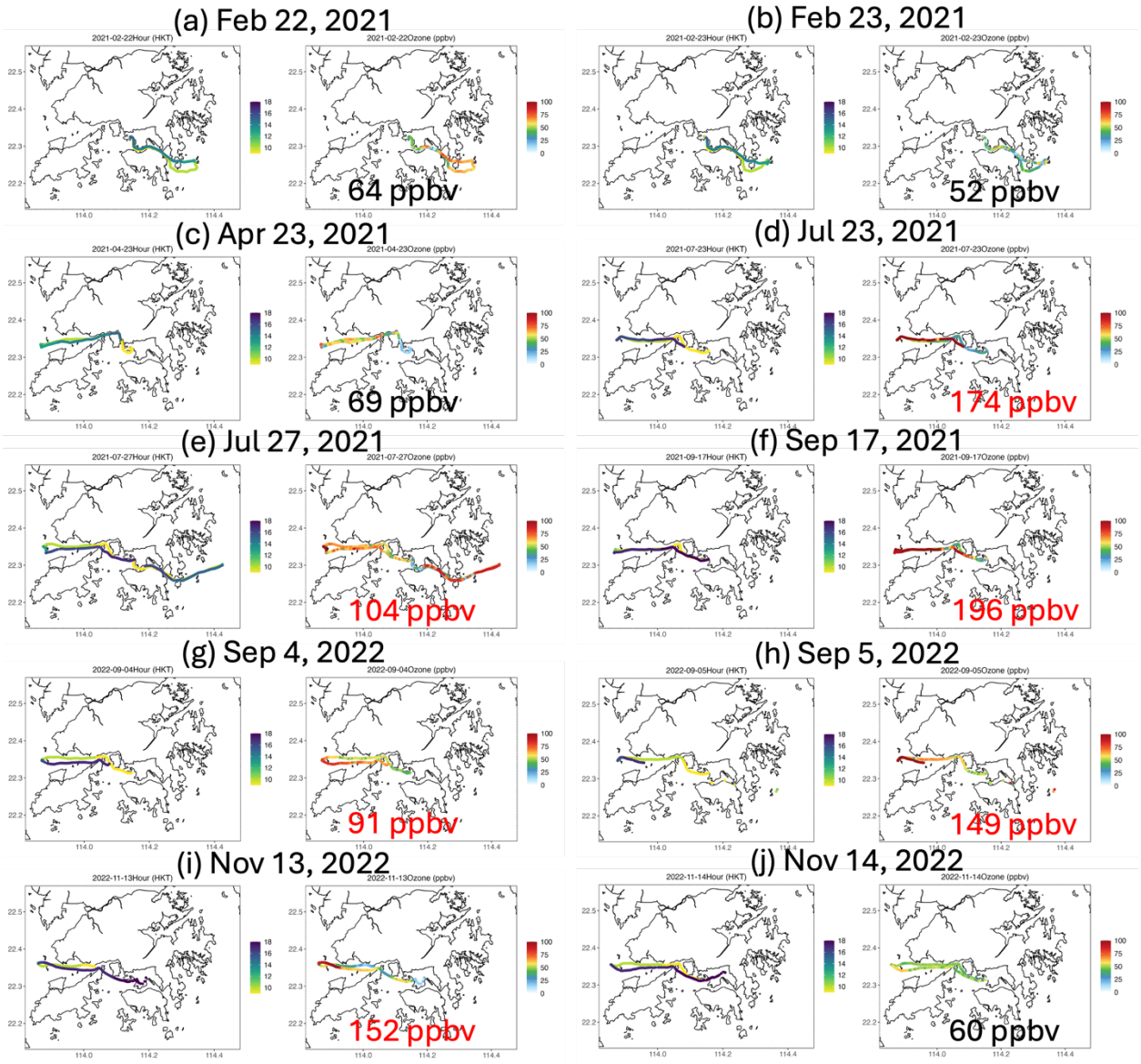

Figure S6. Mobile ship measurements of ozone and the corresponding sampling times for each day. Maximum hourly mean ozone concentrations are inserted.

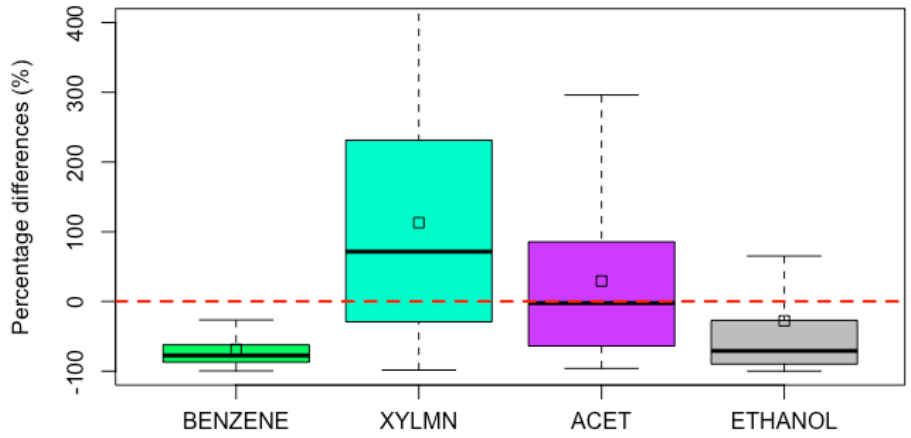

Figure S7. The percentage differences between the observation and model for individual VOC species measured at the HKUST supersite.

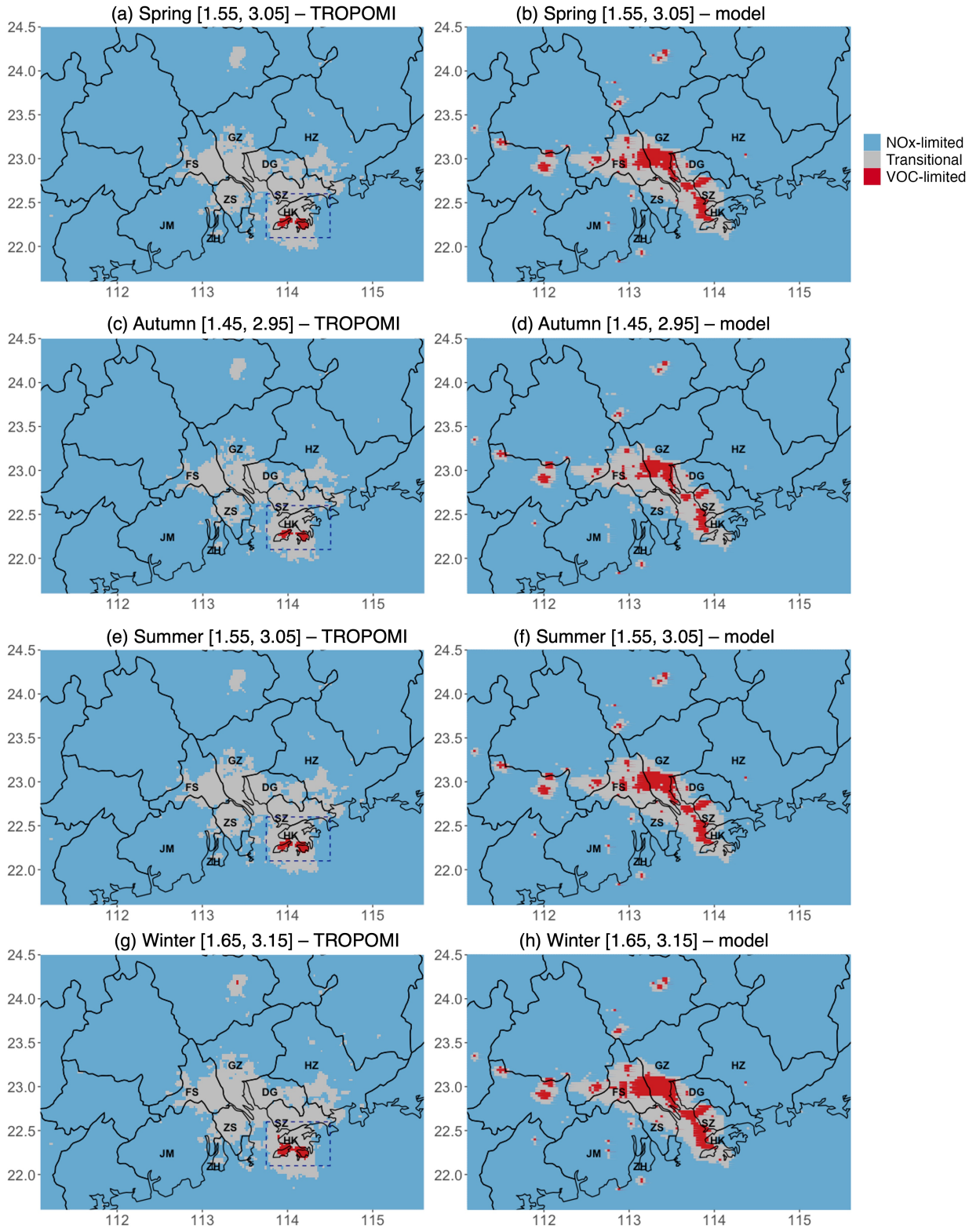

Figure S8. Ozone formation regimes classified using Pearl River Delta region-specific FNR thresholds derived for different seasons, including spring and summer [1.55, 3.05], autumn [1.45, 2.95], and winter [1.65, 3.15], as in Wang Y et al. (2023).

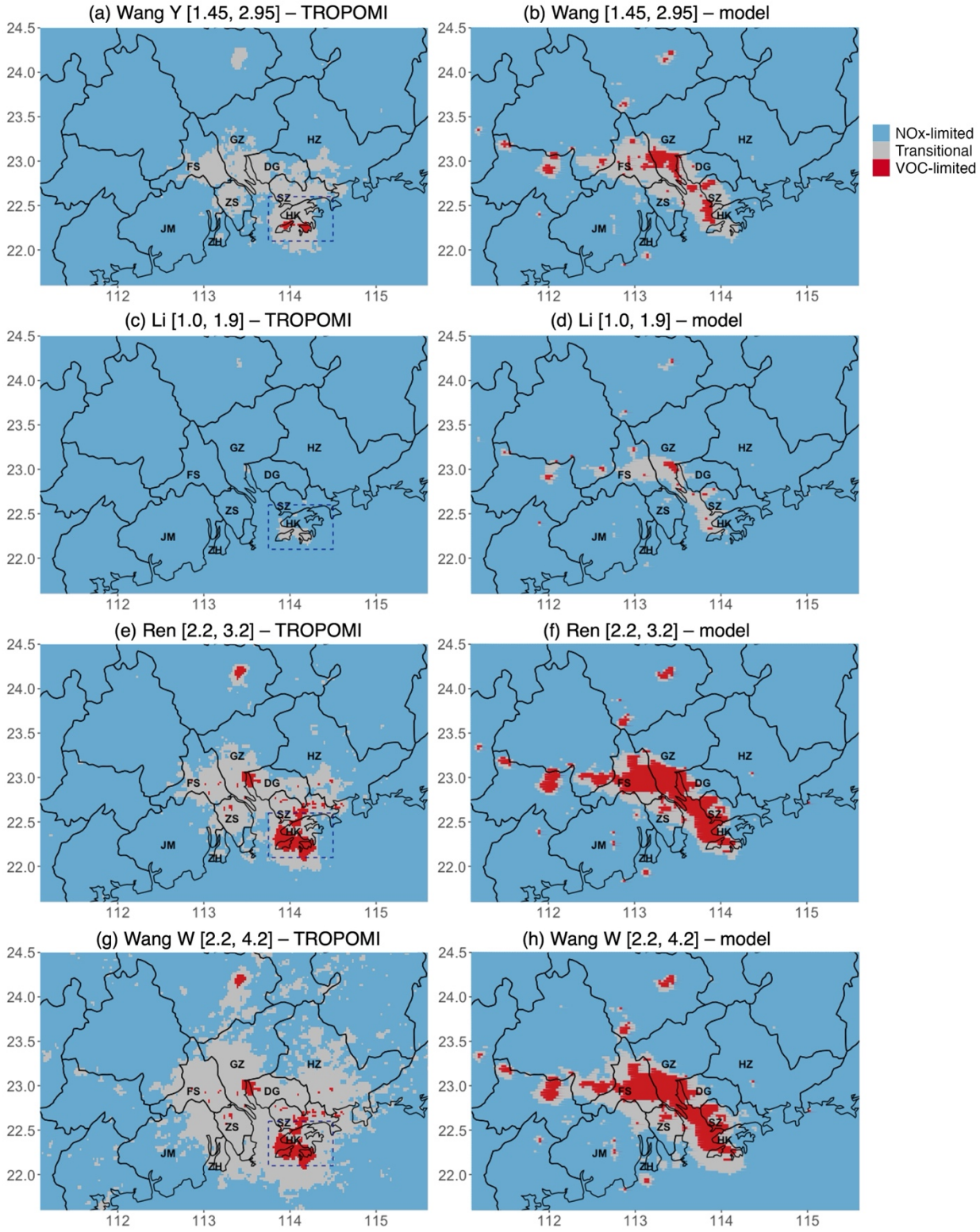

Figure S9. Ozone formation regimes classified using various FNR thresholds derived from different studies, including (a) [1.45, 2.95] from Wang Y. et al. (2023), (b) [1.0, 1.9] from Li et al. (2021), (c) [2.2, 3.2] from Ren et al. (2022), and (d) [2.2, 4.2] from Wang W. et al. (2021).