Near real-time inversion of high-resolution anthropogenic carbon emissions in the Pearl River Delta region based on the four-dimensional local ensemble transform Kalman filter

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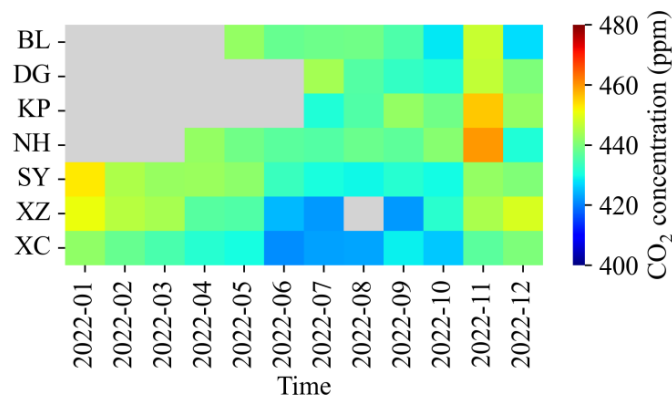
Figure S1. Time series of observational CO₂ concentrations in the Pearl River Delta (PRD) region in 2022. BL: Boluo Station, DG: Dongguan Station, KP: Kaiping Station, NH: Nanhai Station, SY: Shiyan Station, XZ: Xiangzhou Station, XC: Xichong Station
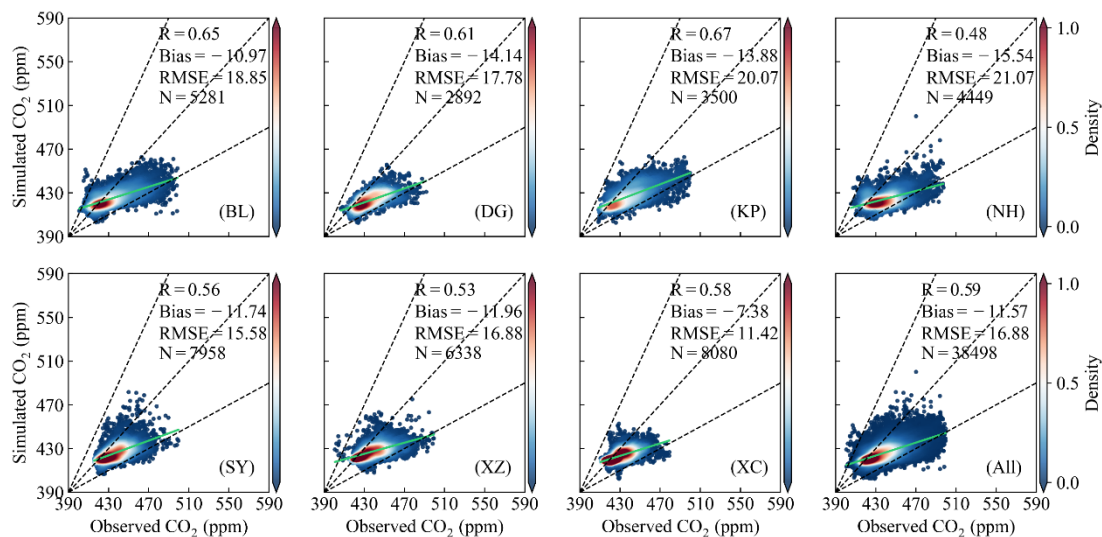
Figure S2. Comparison of hourly CO₂ concentrations from the forward assimilation GRACES-GHG-DA system (Guangzhou Regional Atmospheric Composition and Environment Forecasting System–Greenhouse Gas–Data Assimilation) with observations. BL: Boluo Station, DG: Dongguan Station, KP: Kaiping Station, NH: Nanhai Station, SY: Shiyan Station, XZ: Xiangzhou Station, XC: Xichong Station, All: Aggregated results of all aforementioned stations.
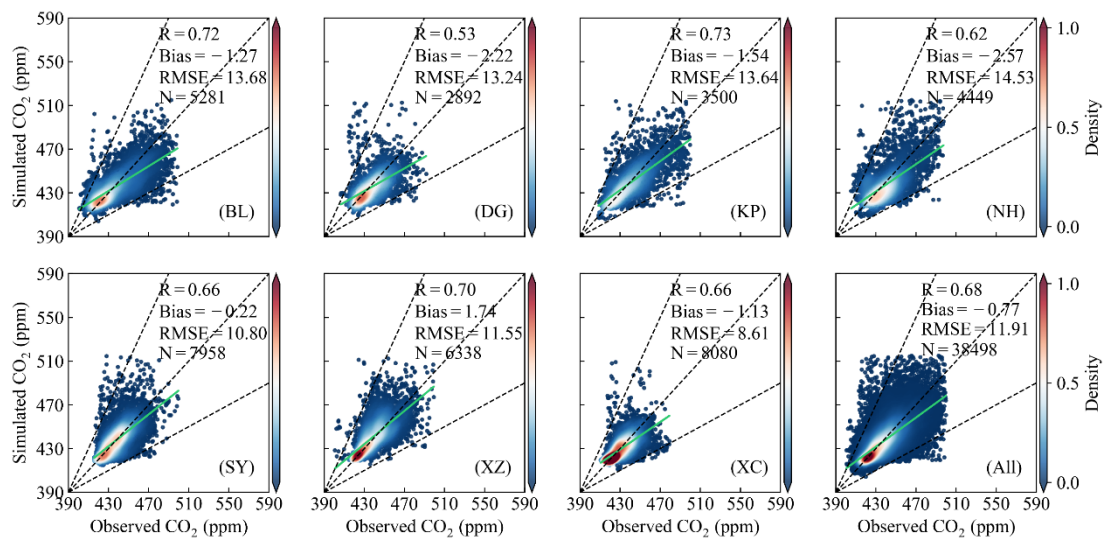
Figure S3. Comparison of hourly CO_2 concentrations from the post–assimilation GRACES-GHG-DA system (Guangzhou Regional Atmospheric Composition and Environment Forecasting System–Greenhouse Gas–Data Assimilation) with observations. BL: Boluo Station, DG: Dongguan Station, KP: Kaiping Station, NH: Nanhai Station, SY: Shiyan Station, XZ: Xiangzhou Station, XC: Xichong Station, All: Aggregated results of all aforementioned stations.
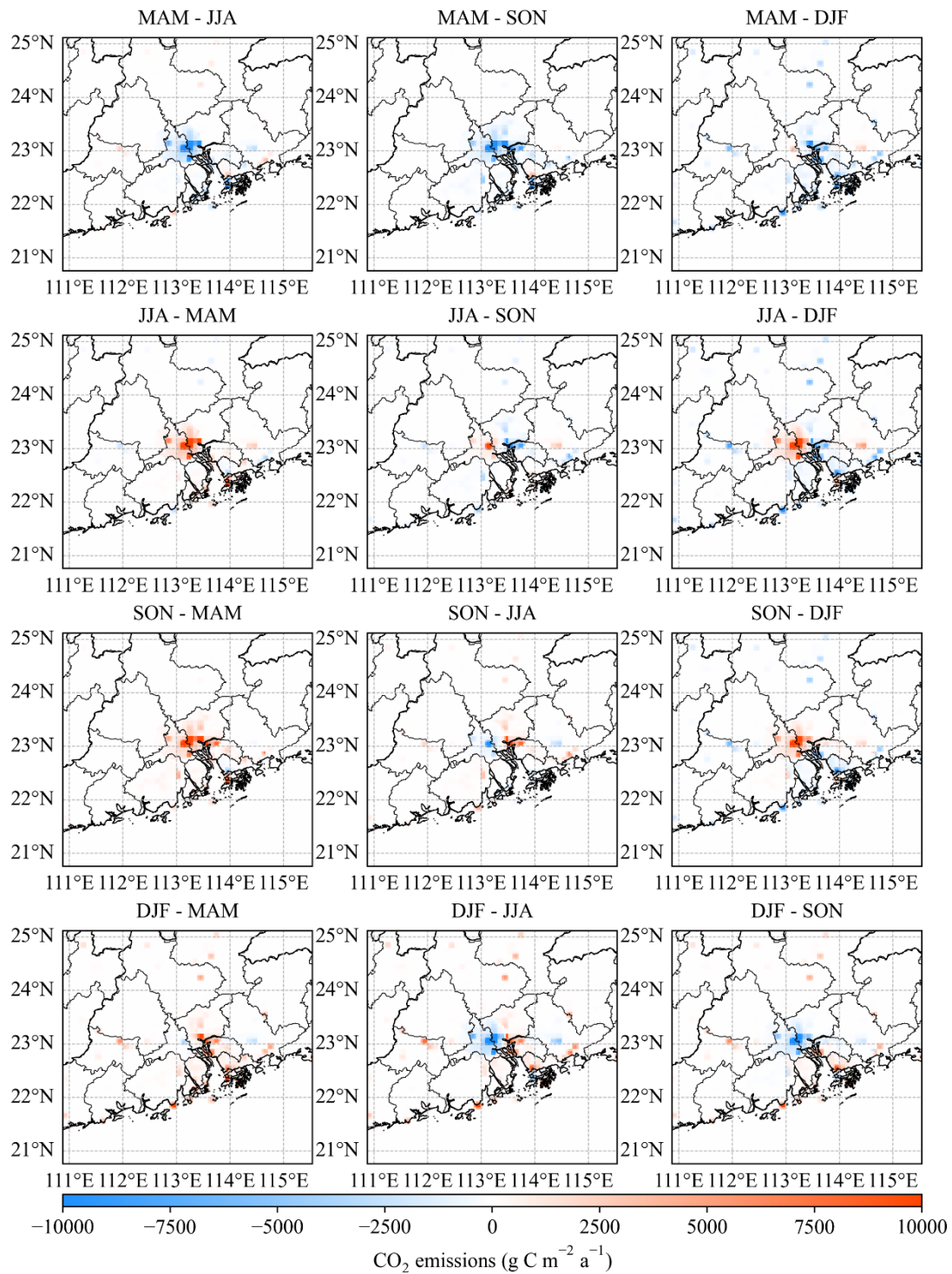
Figure S4. Seasonal differences in inversed CO₂ emissions over the Pearl River Delta (PRD) region in 2022. MAM, JJA, SON, and DJF denote March–May, June–August, September–November, and December–February, respectively. The color bar represents CO₂ emissions.

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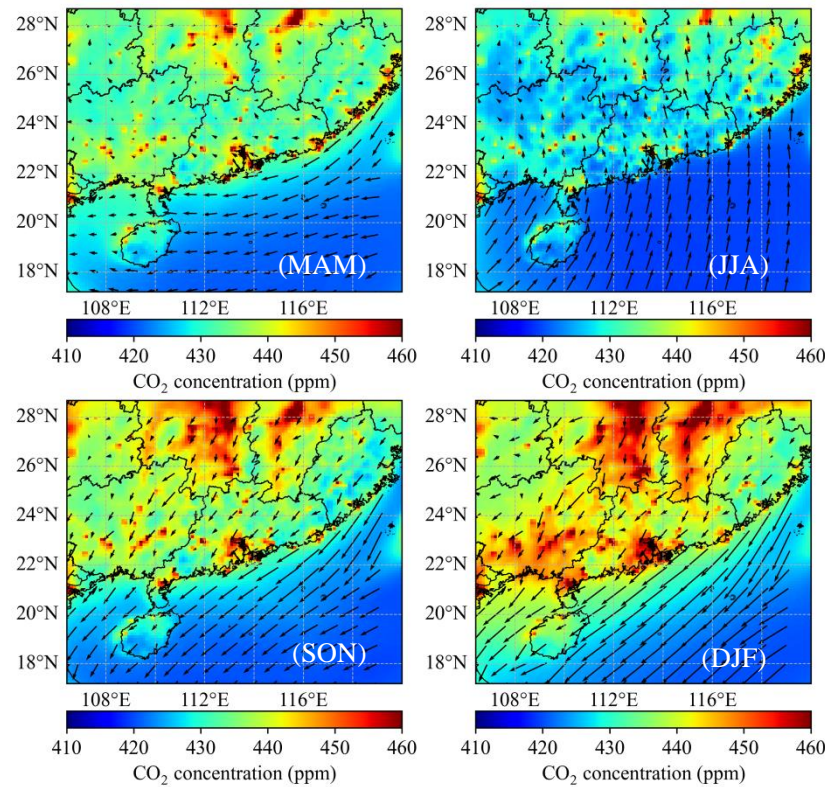
Figure S5. Seasonal distribution of atmospheric CO_2 concentrations over Southern China in 2022. MAM, JJA, SON, and DJF denote March to May, June to August, September to November, and December to February, respectively. The color bar represents CO_2 concentrations.

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