(12-240326-A) **COVID-19 Impacts on the US Methane Emissions**

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Methane is a potent greenhouse gas with ~9 years of lifetime, a global warming potential of 30 over 100 years, and radiative forcing of 0.650 Wm-2 since 1750. In the 26th Conference of Parties (COP26), the U.S. signed the Global Methane Pledge, which aims that by 2030, the emissions must be reduced by 30% relative to the 2020 levels. Hence, monitoring and quantifying CH_4 emissions has become critical towards national greenhouse gas mitigation. In addition, COVID-19 disrupted normal human activities worldwide. Evidence shows that COVID-19 restrictions resulted in a reduction in air pollutants concentrations, however, more research is needed to understand the direct and indirect impacts of COVID-19 on greenhouse gas emissions. Here we present a detailed quantification of methane emissions over the contiguous U.S. We assimilated NOAA CH_4 ObsPack GLOBALVIEW+ observations between December 2017 and January 2021. We used the Hybrid Single-Particle Lagrangian Integrated Trajectory (HYSPLIT) model to simulate atmospheric transport with meteorology from the 12-km NAM nested with Global Forecast System with 0.25 degrees resolution (GFS0.25). We then conducted inverse modeling analyses with different background estimates and prior emissions. Our posterior estimates indicate a reduction of 2020 anthropogenic CH_4 emissions compared to the 2019 level in certain areas consistent across all ensemble estimates. Furthermore, during the first quarter of 2021, there was a strong increment in emissions followed by neutral change for the rest of the year, compared with 2020. The more significant changes were found in regions dominated by the oil and gas industry. This presentation will discuss these 2020 CH_4 emission anomalies and their underlying causes.

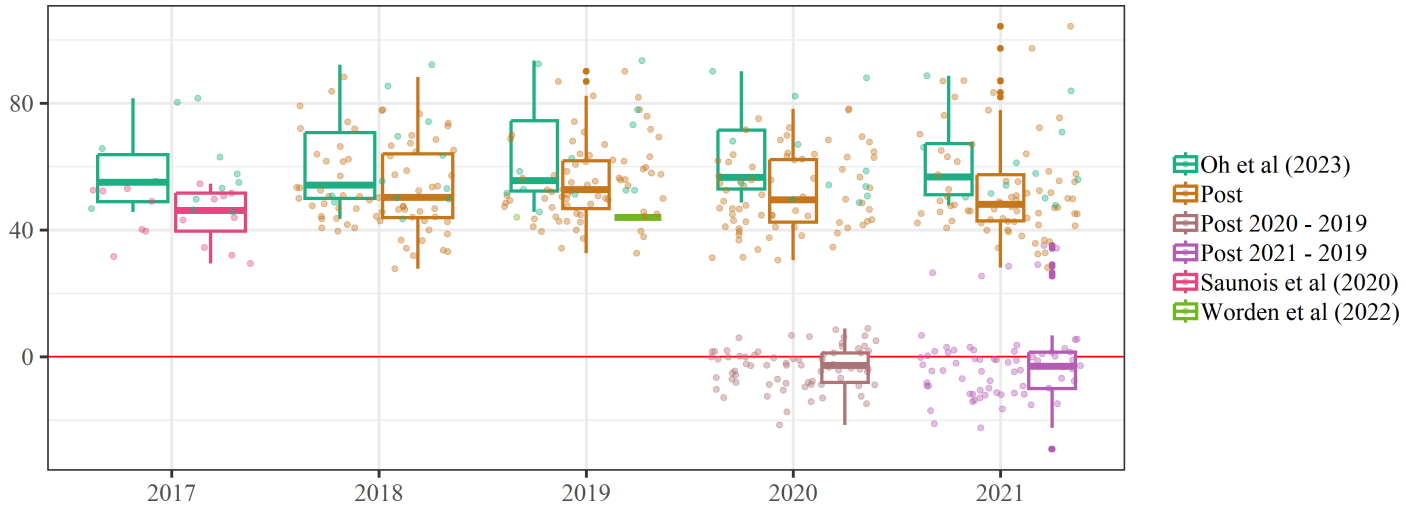

Figure 1. Methane emissions over the US Tgy-1, including literature estimates (Oh et al., 2023; Saunois et al., 2020; Worden et al., 2022).