COVID-19 impacts on the US methane emissions

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Introduction

- **COVID-19**
  - The Coronavirus disease 2019 (COVID-19) is caused by SARS-CoV-2
  - Disruption of global socioeconomic activities
  - 676 million cases. 7 million deaths. Many cases are not registered
- **CH4**
  - Methane is a greenhouse gas (GHG) that affects the Earth's radiative forcing and consequently, the climate system.
  - The NOAA Global Monitoring Laboratory (GML) manages a global network of atmospheric observations compiled and delivered to the public as ObsPack CH_4 GLOBALVIEW+.

Data and Methods

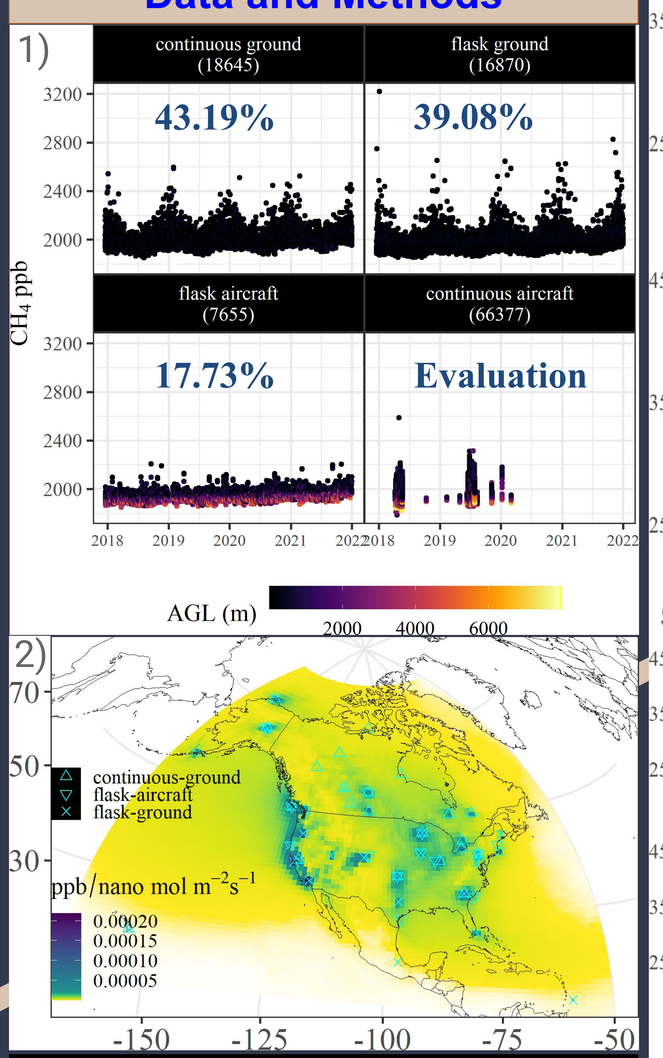

Figure 1) Assimilated observations into inverse modeling, continuous aircraft were reserved for evaluation. **Figure 2)** Average footprints and location of sites of observations assimilated. We used a Lagrangian Inverse Model (Hu et al., 2023). Observations processed with **`rtorff`** (Ibarra-Espinosa and Hu, 2024)

Results

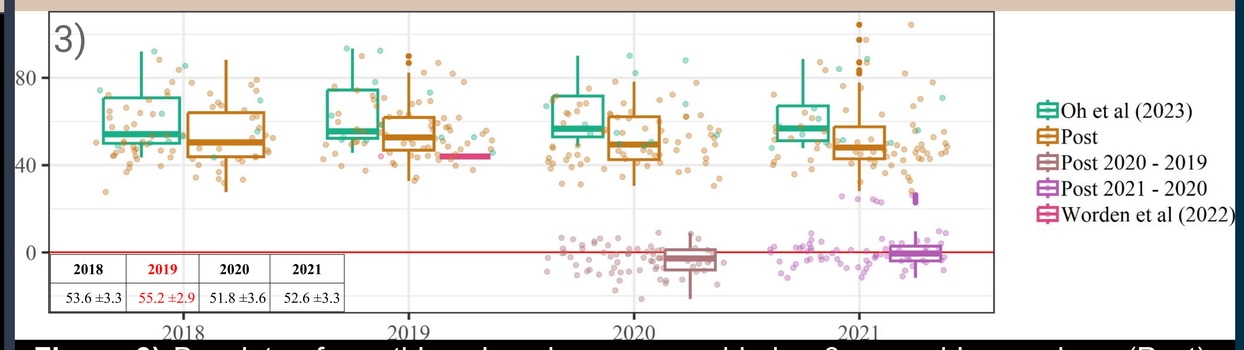

Figure 3) Boxplots of monthly values by year ocnsidering 6 ensemble members (Post). The comparison with Oh et al (2023) and Worden el at (2022) show agreement with the medians. The boxplot of difference 2020 and 2021 with 2019 show negative values.

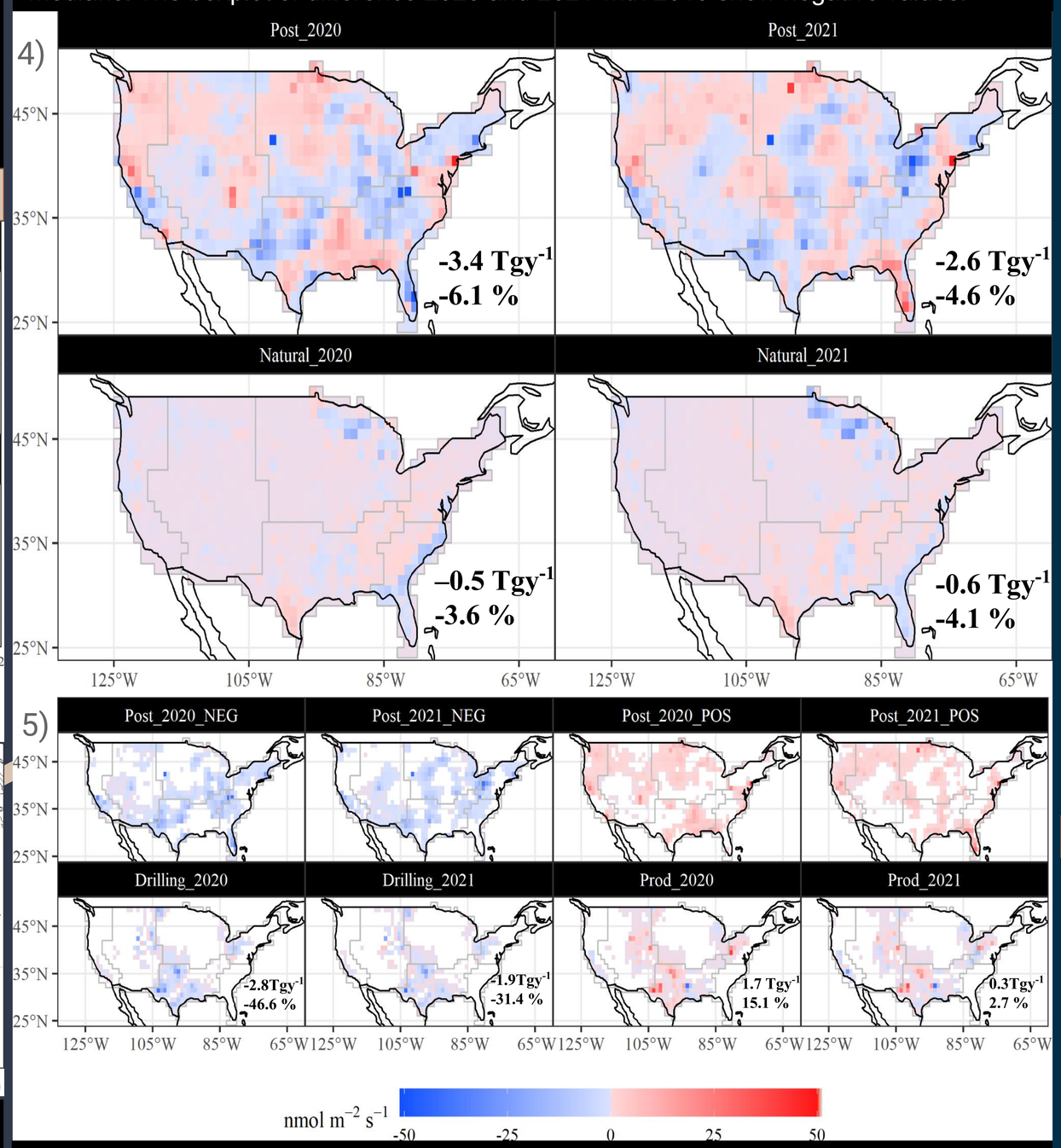

Figure 4) Difference in posterior emissions 2020 and 2021 with 2019. **Figure 5)** Difference in annual posterior emissions separated positive and negative values (at top) and at bottom the difference in NOAA CSL Fuel Oil and Gas emissions by Drilling and Production (Francoeur et al., 2021). The emissions were reduced 6% in 2020 in comparison to 2019, and 4% in 2021. FOG Production emissions increased compared to 2019, but the strongest decrease was with drilling, explaining our results.

Evaluation

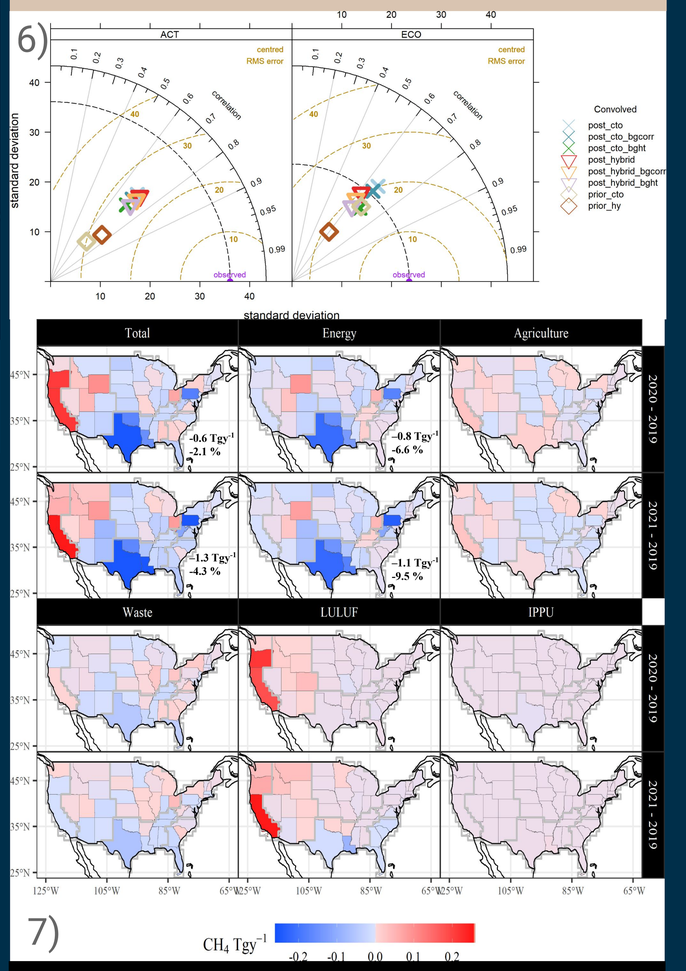

Figure 6) Evaluation with independent data from aircraft in-situ and campaign ECO and ACT. The evaluation consists in the convolution of priors and posterior, where posterior resulted in better agreement with observations. Figure 7) US/EPA Methane emissions difference 2020-2019 and 2021-2019 over the US, where the reductions are explained by the most important sector, Energy, in south and north east US.

References

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