Quantifying methane emissions from the earth and satellite

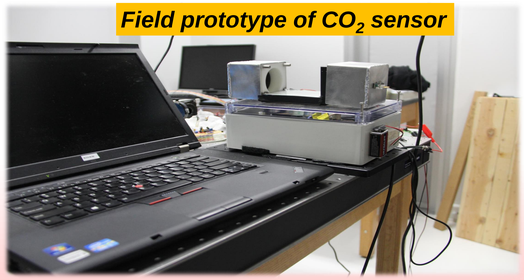
Carlos Diaz and Mohammad A. Khan

Division of Physics, Engineering, Mathematics, and Computer Science

Optical Center for Applied Research, Delaware State University, Dover, DE

Ground-based vs. Satellite Sensing

- Ground-based laser-based sensors can provide precise and real-time measurements of atmospheric emissions in a localized area with *high-spatial and temporal resolution*
- Satellite-based sensing can provide information on a *wide-geographical area* spanning over entire region with large swaths

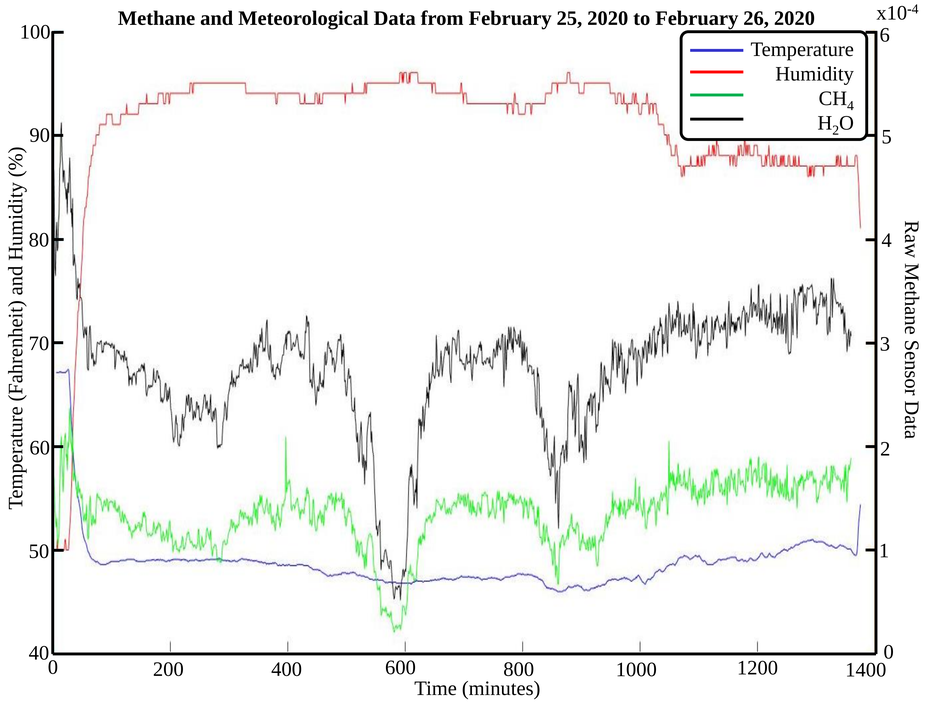


Collecting Meteorological Data

Accurate meteorological data is required to incorporate in gas mixing ratios estimate

Using a Vantage Vue weather station we collected temperature, humidity, and wind speed

Local field deployment



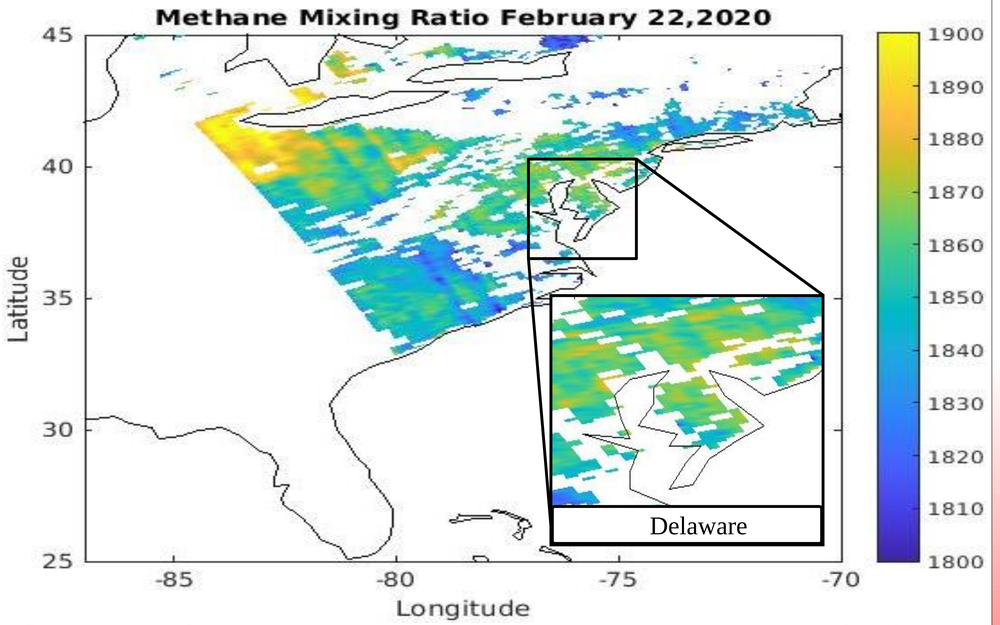
A temporal profile of methane, water vapor with 1-sec. resolution, and, humidity and temperature profiles (1-minute resolution) from laser-based field instruments and the Vantage Vue meteorological instrument

NASA East Coast Methane Mixing Ratio TROPOMI Data

NASA Database
- Search for specific TROPOMI data and download

MATLAB
- Use NetCDF operators to identify variables

Plot
- Create a color map based on methane mixing ratio



Recent satellite data shows elevated levels of methane production in the Kent and Sussex county region of Delaware

Conclusion

- Thermal and UV effect on sensor performance needs further investigation
- More Methane Mixing Ratio data is needed to create a baseline to which we can compare our methane sensor measurements. We plan on collecting data for every week from March 2020 to July 2020

Literature Cited

1. Copernicus Sentinel data processed by ESA, Koninklijk Nederlands Meteorologisch Instituut (KNMI)/Netherlands Institute for Space Research (SRON) (2019), Sentinel-5P TROPOMI Methane CH4 1-Orbit L2 7km x 7km, Greenbelt, MD, USA, Goddard Earth Sciences Data and Information Services Center (GES DISC), Accessed: Jul. 27, 2020, 10.5270/S5P-3p6lnwd

Acknowledgements

Funder Acknowledgement: We acknowledge the Optical Science Center for Applied Research (OSCAR), the National Aeronautics and Space Administration (NASA MIRO grant # NNX15AP84A). We also acknowledge support from NSF (CBET) grant 1645287, Department of Defense (office of Naval Research) grant 12447947, and Interdigital Inc