


Rapid Inference of Physically-informed Top-Down Emissions using the AI-driven Inverse Model with Observations

Bo He, Bojun Li, Jiahui Zhang, Shao Li, Qian Wang, Jiaqi Bao, Anan Geng, Karen Galy-Ponsard, Daniel Wang
George Mason University, University of Tennessee, The University of Arizona, University of Illinois, University of Michigan, U.S. EPA, PNNL



ABSTRACT

Quantifying carbon (CO₂) emissions is essential for climate change mitigation. However, the current top-down CO₂ emission estimates are highly uncertain. This study develops a rapid inference of physically-informed Top-down Emissions using the Inverse Model with Observations (VAG-IME) to estimate CO₂ emissions and methane (CH₄) emissions at the county level in the United States.

METHOD

Inputs: Daily county-level CO₂ emissions, meteorological variables (Temperature, Humidity, Wind, etc.), and satellite-based CO₂ observations.

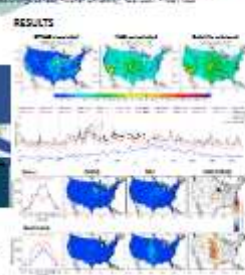
Outputs: Daily county-level CO₂ emissions, CH₄ emissions, and CH₄ emissions at the county level.

VAG Encoder Inverse Emissions System

Input: Daily county-level CO₂ emissions and meteorological variables.

Output: Daily county-level CO₂ emissions and CH₄ emissions.

RESULTS



CONCLUSIONS

CO₂ emissions are highly variable in space and time, and the current top-down CO₂ emissions are highly uncertain. The VAG-IME system can provide accurate and reliable CO₂ emissions at the county level. The VAG-IME system can provide accurate and reliable CH₄ emissions at the county level. The VAG-IME system can provide accurate and reliable CH₄ emissions at the county level.

PRESENTED AT:

Accelerating Informatics for Earth Science 2024



TRANSCRIPT

