

Observed changes in China's methane emissions linked to policy drivers

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Methane emissions in China



Anthropogenic emissions by country and region

Methane emission sector distribution in China



Estimate of China's methane emissions

Bottom-up inventory



Liu et al., 2021

Observation-based inversion



Inverse analysis for China's methane emissions



Observations – satellite + surface network (2010-2017)

- GOSAT CO₂ proxy retrieval from University of Leicester

- Surrounding area WDCGG 6 sites

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Better spatial coverage

Better measurement precision Better sensitivity to surface emissions

Observational constraints on regional emissions

Number of independent pieces of information constrained



DOFS more than doubled for emission trends of Northeast and East China

Joint inversion of satellite and surface observations for China

Zhang et al., PNAS, 2022



Data repository: Optimized monthly emission fluxes on 0.5x0.6 grid (2010-2017)

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Emission trend linked to energy, agricultural, environmental policy



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Emission trend linked to energy, agricultural, environmental policy

2010-2017 rice methane trend



Mg km⁻²
$$a^{-2}$$
 -0.8 -0.4 0.0 0.4 0.8

Unexpected increase as no changes in cultivation area

- Overlap spatially with aquaculture?
- Increased intensity due to more straw return?



Data source: G. Zhang 2011; Z. Shi 2016



TROPOMI Inversion

GOSAT Inversion



Liang et al., ACP, in review

Summary

 China's methane emissions and trends can be constrained at the subnational level by joint inversion of satellite and surface observations



 Regional trends linked to energy, agricultural, and environmental policies can be observed by atmospheric observations, demonstrating the usefulness for such a system to track regional methane emissions.

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