

Assessing the methane mitigation potential of innovative management in US rice production

Reavis, C.W., Reba, M.L., Shults, D.D., Runkle, B.R.K., 2023.

Environ. Res. Lett. 18, 124020. <https://doi.org/10.1088/1748-9326/ad0925>

Science Questions

- What is the methane mitigation potential of alternative management in US rice systems?
- What is the potential for application and improvement of a regional Tier 2 method for estimating rice methane emissions in the US?

Analysis

- Utilizes landcover and clay content datasets (USDA-NASS, 2022; USDA-NRCS, 2018) to spatially represent rice methane emissions and mitigation potential in the US Mid-South and California, the US's primary rice-producing regions.
- We constrained our observation to the most common rotations: rice-soybeans and rice-rice.
- Differences in management were introduced using scaling factors, which alter the baseline flux estimate across different scenarios (Linguist et al., 2018).

Results/Significance

- In our study, rice produced between 0.32 and 0.45 Tg CH₄ yr⁻¹ across the US Mid-South and California. Our estimates were 7% and 42% lower compared to UN FAO and US EPA inventories, respectively, which employ a different set of methods than this study.
- Using single or multiple aeration events could potentially reduce methane between 39% and 83% (taken from Linguist et al., 2018), amounting to 0.14 and 0.31 Tg CH₄ yr⁻¹ in reductions, respectively, when applied in this study.
- Tier 2 mitigation potential was greater in the US Mid-South compared to California. Lower clay contents in the US Mid-South resulted in larger baseline fluxes on average compared to California.
- Further refinement of the Tier 2 approach could inform how management practices are applied across regions based on mitigation potential. The refinement should include better representation of management practices and their respective effects across regions.

Acknowledgements

This research was supported by the NASA Carbon Monitoring System (ROSES 2020) Award 80NSSC21K1002.

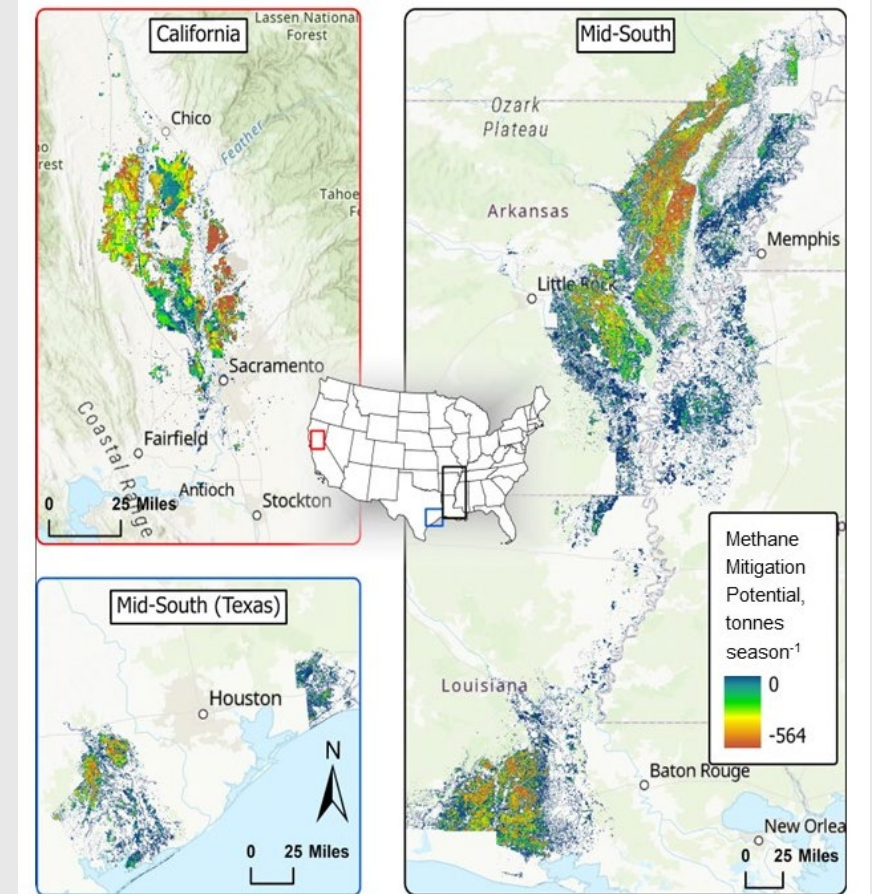


Figure 1. Mitigation potential estimated as the difference between Tier 2 baseline and multiple aeration scenarios in the US Mid-South and California between 2008 and 2020. Red areas indicate the greatest potential for methane reduction using multiple aeration events.