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NOAA Global Monitoring Laboratory operates a cooperative global air sampling network (Global Greenhouse Gas Reference Network) to measure the spatial and temporal distribution of key long-lived greenhouse gases. High-quality measurements from this network show global surface CH4 increased at an unprecedented rate of 14 ppb/yr in 2020-2023, fastest since the beginning of systematic CH4 measurement started in 1983. This rise has been accompanied by an exceptional plunge in the stable carbon isotopes of CH4, ?13C(CH4). Geographic spread of growth and the rapid isotopic plunge suggest strong rises in isotopically light emissions from tropical and boreal wetland areas, which is potentially a positive climate feedback on CH4 emissions. In this presentation, we will first take a look at the latest measured CH4 and ?13C(CH4) signals from these surface measurements.

It remains difficult to accurately quantify contributions from different source sectors to recent CH4 surges. Atmospheric inversions informed by surface CH4, ?13C(CH4), or satellite CH4 retrievals are often used to infer emission changes. Some consistencies and discrepancies have been found among inversions using different type of data. Large increases in tropical emissions from wetland areas are consistently derived from different inversions, which can explain a significant decrease in atmospheric ?13C(CH4). But the emission growth inferred from GOSAT-based inversions differ quite significantly from inversions based on surface measurements. Further investigations are needed on how to reconcile diffeEd Dlugokencky, Sylvia Michel, Xin Lin, Youmi Oh, Lori Bruhwiler, Sourish Basurent data constraints to better inform the global CH4 budget.
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