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Efforts to mitigate methane (CH4) and carbon dioxide (CO2) emissions are complicated by inconsistencies between estimates derived from atmospheric measurements, greenhouse gas inventories, and self-reporting programs. Contributing to these discrepancies are a relatively small number of industrial facilities that emit anomalously high amounts of greenhouse gases, often in an unpredictable and intermittent fashion. Lack of transparency, spatio-temporal completeness, measurement sensitivity and costs are barriers to diagnosing and mitigating point-source emissions at scale across geographically dispersed infrastructure.
We present the predicted on-orbit performance of the Carbon Mapper program, a constellation of small satellites designed to track individual CH4 and CO2 point-source emitters in priority regions globally. Carbon Mapper is implemented as a public-private partnership with an open data policy for CH4 and CO2. The first two satellites are funded for launch and will characterize the global distribution of point-sources in priority regions at 30m spatial resolution with visible-infrared imaging spectrometers. The system is designed for expansion to a larger satellite constellation offering sub-daily to weekly sampling. We also present findings from prototype airborne surveys of diverse regions and emissions sectors including lessons learned from follow-up site-level measurements and mitigation by facility operators. We also describe advances with a new operational multi-sensor analysis framework that combines airborne and satellite (e.g., EMIT) observations for routine publication through a global data portal with implications on the emerging multi-scale (tiered) observing system of systems.
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