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ESTIMATING METHANE EMISSIONS FROM METROPOLITAN AREAS USING HIGH RESOLUTION SATELLITE IMAGERY TO COMPLEMENT THE IPCC AND GLOBAL PROTOCOL FOR COMMUNITY-SCALE (GPC) ESTIMATIONS

Abstract

The past decade has seen a substantial increase in the ability of Earth Observation (EO) satellites to detect and quantify sources of urban anthropogenic methane emissions. While earlier instruments such as Sentinel-5P TROPOMI, launched in 2017, can detect anomalous methane concentrations at the city-wide, regional, and global scale, a new generation of satellites that have been launched since then can resolve and measure point sources of methane down to the facility level. These advancements are occurring in both the civil and commercial sectors, with projects like the Environmental Defense Fund's MethaneSAT and NASA's EMIT being released alongside private ventures like DigitalGlobe's WorldView-3 and the GHGSat constellation. Scientists are also discovering ways to leverage the multispectral and hyperspectral capabilities of existing satellites to get similar data, as in the case of the Italian Space Agency's PRISMA or the German EnMAP. So far, however, there is a lack of accessibility between the data provided by these missions and the potential end users who would use it to inform local climate policy. It remains difficult for those who are not already experts in atmospheric science or space technology to access this data, convert it to a usable form, and interpret it for proper decision making.

The city of Rio de Janeiro emerges as an appropriate case study for studying this phenomenon. As a result of national and local climate action commitments, the city's Pereira Passos Institute (IPP) has been tracking urban activities to estimate methane emissions using models and calculations provided by the IPCC and the Global Protocol for Community-Scale (GPC). This approach relies on expected patterns of emissions for a given activity rather than taking direct measurements. While this methodology allows estimates of general and annualized trends in the amount of methane emitted by a given economic sector, there are several limitations and factors that it cannot account for, including the possibility of transient or as-yet unknown sources. These analysts are just beginning to harness the opportunities provided by the new EO satellites to observe methane, but challenges remain in their full implementation and incorporation into climate policy. This paper summarizes the efforts of a collaborative team including researchers at the Massachusetts Institute of Technology and the IPP to overcome these challenges, and

proposes a method for local policymakers to take advantage of space technologies to supplement their climate and sustainability initiatives in an accessible manner.