Mission Design and Introduction to the First Korean Spaceborne Methane Monitoring Project: Narsha

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With the increasing demand for reliable Monitoring, Reporting, and Verification (MRV) systems in the global effort to mitigate anthropogenic greenhouse gas emissions, space-based monitoring has emerged as a prominent technology. Methane (CH_4) is the second-most abundant anthropogenic greenhouse gas with a global warming potential of approximately 21 times greater than that of carbon dioxide (CO_2) over a 100-year period. Thus, effective monitoring of methane emissions is crucial for establishing a dependable MRV system and ultimately achieving reductions in anthropogenic emissions.

In this study, we introduce the first Korean spaceborne methane monitoring project, Narsha. The Narsha project is a collaborative effort involving Nara Space Technology Inc., the Climate Lab of Seoul National University, and the Korea Astronomy and Space Science Institute. This project aims to develop and operate a methane observation microsatellite to detect and quantify methane emissions at a local scale from point sources.

The first Korean methane monitoring satellite of the Narsha Project is scheduled for launch in 2026 and will operate as part of a Low Earth Orbit (LEO) constellation. The primary payload comprises of a hyperspectral imager operating in the Short Wave Infrared (SWIR) spectrum, specifically detecting the weak methane absorption band

between 1630-1675 nm. With a spectral resolution of approximately 0.1 nm, a ground sampling distance (GSD) less than 30 m, and a swath width of approximately 12 km at an altitude of 500 km, this imager enables the detection of point-source methane emissions at a local level, even amidst complex environmental backgrounds such as forests and urban areas. In addition, the satellite consists of on-board processing capabilites which include cloud detection and a high-speed communication system to ehance the accuracy of methane estimation and to streamline data processing.
As the first-ever satellite for the purpose of detecting and estimating methane emissions at a local scale, the Narsha project aims to support the development of a robust MRV system. This project aims to develop a satellite that provides reliable and timely point-source methane monitoring data to achieve the goal of reducing anthropogenic emissions of greenhouse gases.

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