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GLOBAL HIGH RESOLUTION METHANE DETECTION WITH THE GHGSAT CONSTELLATION

Abstract

Methane (CH4) is a powerful greenhouse gas contributing to Earth's changing climate. To take steps to reduce greenhouse gas concentrations, knowledge of the sources and the emission quantity is required by governments and industrial operators. Using a combination of satellite and airborne technology, GHGSat Inc. intends to become the global reference of remote sensing of CH4 emissions from industrial sites in sectors such as oil and gas, mining, landfills, power generation, and agriculture. This is all achieved at a fraction of the cost of comparable alternatives due to the use of small satellite technology.

GHGSat launched its pioneering demonstrator satellite GHGSat-D, or Claire, in June 2016 which became the first satellite designed to measure CH4 emissions from individual sites. In order to enhance this capability, GHGSat is planning a satellite constellation with an additional 10 satellites to launch over the next several years. GHGSat has already launched the first two satellites of the commercial constellation, GHGSat-C1 (Iris) and GHGSat-C2 (Hugo), in September 2020 and January 2021, respectively. Combined, the three satellites have successfully collected high resolution CH4 measurements from thousands of sites around the world. The payloads are wide-angle Fabry-Perot (WAF-P) imaging spectrometers operating in the short-wave infrared (SWIR) wavelengths between 1600-1700 nm with a field of view of approximately 12 12 km. The spatial resolution is less than 50 m on Claire and has a point source detection threshold on the order of 10 kt/yr CH4. Design improvements made to the subsequent satellites Iris and Hugo result in an enhanced spatial resolution of around 30 m and a target CH4 precision of less than 2

GHGSat has also developed an aircraft variant instrument, GHGSat-AV, that is based on the same WAF-P spectrometer technology as the satellite payloads. The instrument includes adaptations for airborne operations such as custom fore-optics with a wide angular field of view, an input baffle for stray light control, and vibration isolation for flight operations. GHGSat uses its satellites and aircraft sensors as a hybrid tiered observation system that can both monitor sites frequently to detect and measure large leaks, as well as provide comprehensive monitoring of smaller leaks.

This paper discusses new developments in the GHGSat constellation in addition to the on-orbit results of the most recent satellites, Iris and Hugo.