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Author: Ms. Laura Bradbury
UTIAS Space Flight Laboratory, Canada

Mr. Michael Ligori
UTIAS Space Flight Laboratory, Canada
Mr. Robert Spina
UTIAS Space Flight Laboratory, Canada
Mr. Daniel Kekez
UTIAS Space Flight Laboratory, Canada
Mr. Pawel Lukaszynski
Space Flight Laboratory, University of Toronto, Canada
Dr. Robert Zee
Space Flight Laboratory, University of Toronto, Canada
Mr. Stephane Germain
GHGSat Inc., Canada

ON-ORBIT GREENHOUSE GAS DETECTION WITH THE GHGSAT CONSTELLATION

Abstract

Industrial operators are increasingly motivated by regulatory and operational imperatives to quantify their greenhouse gas (GHG) and air quality gas (AQG) emissions with the intent of ultimately reducing them. Utilizing novel satellite technology, GHGSat Inc. intends to become the global leader of greenhouse gas remote sensing. In June 2016, GHGSat-D (Claire) was launched, becoming the first high-resolution microsatellite designed to measure greenhouse gas emissions from point sources, such as industrial facilities and power plants. The bus was provided by the Space Flight Laboratory (SFL) under contract to GHGSat Inc. Claire has successfully demonstrated greenhouse gas measurements around the world, and one such measurement of methane emissions from a hydroelectric dam in Africa was released publicly in early 2017.

In order to extend the service capability and as a precursor to a full constellation, GHGSat-C1 and GHGSat-C2 are the next two microsatellites under development. With a mass of approximately 16 kg each, the design follows its predecessor Claire in leveraging SFL's Next Generation Earth Monitoring and Observation (NEMO) bus. Bus platform modifications such as enhanced electromagnetic compatibility and hardware redundancy will result in increased performance and reliability. Enhancements to the payload include reduced stray light, onboard calibration capability, and additional radiation mitigation. Furthermore, the inclusion of an optical downlink as a technology demonstrator will result in greater data downlink capacity. These upgrades will be entirely accomplished with the same volume and power constraints as Claire. The development of the GHGSat-C1 and GHGSat-C2 satellites is currently underway and the first of the two is scheduled for launch at the beginning of 2019. This paper describes the mission of the GHGSat constellation and the innovative bus and payload technologies that will enable future development of a full satellite constellation.