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FACSAT-2, AN ACHIEVEMENT THAT WILL CONTRIBUTE TO THE SUSTAINABILITY OF THE
COLOMBIAN TERRITORY.

Abstract

The FACSAT-2 mission (SAT-CHIRIBIQUETE) represents a significant milestone in the field of Earth observation in Colombian space history. Its payloads correspond to two state-of-the-art instruments designed specifically for CubeSat-type satellites. The first load corresponds to a MultiScape 100 CIS multispectral camera, with an approximate spatial resolution of 5 m, and the second one is an ARGUS 2000 shortwave infrared spectrometer (1000-1700 nm).

The integration of a spectrometer as a second payload opened the opportunity for Colombia, within its strategy of sustainability and mitigation of the effects of climate change, to have the potential to analyze large emitters of greenhouse gases (GHG), specifically CO₂ and CH₄. This initiative represents an important achievement for the country, becoming the first payload of its kind in South America for the study of GHG, allowing us to address climate change through the measurement of GHG from the country's large super emitters.

To mitigate the effects of GHGs, its spatial location must be known, and the magnitude of its emission and its temporal variation must be characterized. Meeting these requirements is the main challenge that the FACSAT-2 satellite project currently faces and is based on having a correct georeferencing of the possible emission sources and achieving the quantification of the concentration (ppm) and emission (kg/h) of the gases from the spectral signatures acquired by the spectrometer. Georeferencing involves the precise assignment of geographical coordinates of the acquired data, which, together with the information from the multispectral camera, will allow a visual approach to the emission source. On the other hand, the quantification of the concentration and emission requires the development of in-house algorithms to identify and calculate the concentration of greenhouse gases in the atmosphere.

This article explains the processing workflows for both types of data, images, and spectra, to prepare

the data for GHG analysis and its contribution to the country's sustainability, thus contributing to the reduction goal of Emissions proposed by Colombia in 2050. In addition, the characterization of the satellite data that has been collected since its launch (April 2023) and the strategy to advance the challenges of optical and signature processing, geometric correction, and synchronization of georeferentiation are analyzed.