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MONITORING OF GREENHOUSE GASES USING INFRARED GRATING SPECTROMETER

Abstract

The objective of our mission is to detect Greenhouse gas constituents in the near infrared region using earthshine spectra. These gases have important impacts on the earth's climate, which occur in concentrations as small as a few parts per billion (PPB) or even a few parts per trillion (PPT), and all together add up to less than 1The equipment used will be a SPC (single Photon Count) Device. The advantage of such a device is that it can detect the exact number of photons of the required wavelength. This in turn will give us the liberty to shortlist the gases in the field of view of the spectrometer. The spectrometer uses Near Infrared spectral range 900-1700 nm to record nadir spectra of the radiation emitted from a 1 km footprint under the spacecraft's path. The gaseous composition of the air mass along the instrument's line of sight may be inferred through measurement of absorption features associated with a particular gas. The spectrometer will observe carbon dioxide, and water vapour-absorption bands in order to determine near-surface column amounts for greenhouse gas emission. The equipment which is a micro-spectrometer observing in the spectral range of 900-1700 nm will have a spectral resolution of about 6 nm. An InGaAs detector with diffractive optics is used. An IFOV of 1 mrad is used to provide a high resolution pollution-mapping capability for this prototype instrument. The data obtained will have a impact on atmospheric studies and atmosphere awareness. It will provide an excellent platform for the exploration of novel methods of remote sensing and advanced modeling experiments. The retrieval of data is a novel approach and takes into account for all the phenomenon affecting the earthshine spectra reaching the spectrometer.