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Author: Dr. Hector Vargas
Mexico

Dr. Aurelio Heredia
Mexico
Dr. Maria de la Luz Garcia
Mexico
Prof. Enrique Sanchez
Mexico
Dr. José Hernández
Universidad Popular Autónoma del Estado de Puebla, United States
Dr. Juan Carlos Cisneros
Mexico

SPACE ORBITING SPECTROSCOPY TO CHARACTERIZE AEROSOL EMISSIONS OF MEXICO'S POPOCATEPETL VOLCANO

Abstract

In order to determine the concentration of particles in aerosols, the best sensors identified to date are spectrographic systems or multispectral sensor arrays. A multispectral sensor array requires a maximum of one unit (10 cm3 footprint) in the design of our cubesat monitoring system. La Universidad Popular Autónoma del Estado de Puebla (UPAEP) is designing a three unit 3U (10 x 10 x 30 cm footprint) cubesat for earth observations, specifically around Puebla and the surrounding volcanic area. A synchronous orbit with a solar inclination of about 98 degrees and between 400-800 km above the earth allows the 3U satellite to pass over the same latitude at the same time every day allowing for the use of a sunlit view of the earth's surface in both visible and infrared wavelengths. UPAEP's 3U cubesat will be designed with a 1) base unit system, 2) an attitude control system and 3) a spectroscopy system unit. This proposal focuses on the development and integration of a multispectral imaging system in a 3U CubeSat using spatial spectroscopy in a series of up to 20 spectral bands within the spectral range of 500-900 nm. The size of the data files collected by the generator can be adjusted to spectral images ranging in sizes of 10 to 500 MB. Consideration of the size of files to be transmitted is a concern due to data transmission rates to the ground station. For example, an orbital altitude of 500 to 800 kilometers, with only one earth station requires a reduction in the number of spectral images taken and transmitted during line of site data collection. The imaging transmission system will choose the strategy of processing the multispectral images on the CubeSats onboard computer and sending results in much smaller data packages (figure 2). All information retrieved at the ground station will serve as a data repository for analysis of climate changes; for the analysis of the volcanic activity of Popocatepetl, and as an additional source of data analysis to the SERVIR research community.