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ON-ORBIT RESULTS OF THE NIRST MULTISPECTRAL IMAGER

Abstract

The New Infrared Sensor Technology (NIRST) is a multispectral imager built under a Collaborative Agreement between the Canadian Space Agency (CSA) and the Comisión Nacional de Actividades Espaciales (CONAE) of Argentina. NIRST has one band in the mid-wave infrared (MWIR) centered at 3.8μm with a bandwidth of 0.8μm, and two bands in the thermal infrared (TIR), centered respectively at 10.85 (TIR1 band) and 11.85μm (TIR2 band) with a bandwidth of 0.9μm. The temperature range is from 300 to 600 K for the mid-infrared band and from 200 to 400 K for the thermal bands. The design of NIRST is based on a set of linear arrays of 512x3 microbolometers jointly developed by INO and the CSA. The instantaneous field-of-view is 534 microradians corresponding to a ground sampling distance of 350 m at the sub-satellite point. The instrument allows retrieving, among other data, surface temperature of forest fires and ocean water.

After the launch in June 2011, analysis of the first images confirmed the reliable in-orbit operation and consistency with pre-launch characteristics for all spectral bands. Algorithms have been developed to perform post processing and absolute radiometric calibration of images in all bands. During the commissioning phase, deep space measurements were taken to characterize the variation of the offset with instrument temperature. For nominal operations, in-flight gain and offset values are evaluated for all pixels by means of deep space measurements and cross calibration with reference spaceborne sensors of lower spatial resolution (MODIS and GOES). Preliminary assessment of the images calibrated using these values showed that they are in agreement with those retrieved from GOES sensor. The results obtained further suggest that the MWIR channel may be used advantageously to identify small fires and study fire distribution.

The paper will first present an overview of the design of the microbolometer detectors and NIRST instrument. Calibration procedures and level-1B algorithms will then be detailed and images captured over North America during the fire season will be discussed.