In-orbit Absolute Radiometric Calibration of Formosat-5 RSI

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FORMOSAT-5 (FS-5), launched in August 2017, is the first indigenously developed Earth observation satellite by
the National Space Organization of Taiwan. The main payload onboard is optical sensor named Remote Sensing
Instrument (RSI). The radiometric sensitivity of a new optical sensor may be unstable especially during the first
year after launched. Therefore, the in-orbital radiometric calibration is essential and significant to maintain the im-
age quality of optical sensor, which is the main aim of this study. Two in-orbital radiometric calibration approaches,
vicarious and cross calibration, are examined by field campaigns on the calibration sites (Railroad Valley Playa and
Ivanpah Playa in Nevada, California). The ground-based measurements of atmospheric parameters and surface re-
flectance are primarily collected for vicarious calibration, while the reference images from Landsat-8 Operational
Land Imager (L-8 OLI) are employed for cross-calibration. The derived radiometric coefficients (physical gain)
of RSI spectral bands are based on the near simultaneous observations between the received radiance on the top
of atmosphere, FS-5 RSI and L-8 OLI spectral digital numbers. The results indicate that the variation of optical
sensitivity of RSI are obvious after launched. The physical gain in each band has no evident consistency in 2017,
but it tends to stable on the order of 3-5% of variation for most part of spectral bands in 2018. The results also
suggest that the periodical calibration is necessary and very important to the further scientific applications.