

Comparison of MODIS and VIIRS On-board Blackbody Performance

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MODIS has 16 thermal emissive bands (TEBs), covering wavelengths from 3.7 to 14.4 microns. MODIS TEBs are calibrated on-orbit by a v-grooved blackbody (BB) on a scan-by-scan basis. The BB temperatures are measured by a set of 12 thermistors. As expected, the BB temperature uncertainty and stability have direct impact on the quality of TEB calibration and, therefore, the quality of the science products derived from TEB observations. Since launch, Terra and Aqua MODIS have successfully operated for more than 12 and 10 years, respectively. Their on-board BB performance has been satisfactory in meeting the TEB calibration requirements. The first VIIRS, launched on-board the Suomi NPP spacecraft on October 28, 2011, has successfully completed its initial Intensive Calibration and Validation (ICV) phase. VIIRS has 7 thermal emissive bands (TEBs), covering wavelengths from 3.7 to 12.4 microns. Designed with strong MODIS heritage, VIIRS uses a similar BB for its TEB calibration. Like MODIS, VIIRS BB is nominally controlled at a pre-determined temperature (set point). Periodically, a BB Warm-Up and Cool-Down (WUCD) operation is performed, during which the BB temperatures vary from instrument ambient (temperature) to 315K. This paper examines NPP VIIRS BB on-orbit performance. It focuses on its BB temperature scan-to-scan variations at nominally controlled temperature as well as during its WUCD operation and their impact on TEB calibration uncertainty. Comparisons of VIIRS (NPP) and MODIS (Terra and Aqua) BB on-orbit performance and lessons learned for future improvements are also presented in this paper.