Validation of ASTER and MODIS Thermal Infrared Data Products

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Abstract

In 1999 NASA's first Earth Observation System platform was launched into earth orbit. Five instruments are mounted on the platform that will be used to produce a set of standard data products for the scientific community. The standard products include several products derived from the data acquired in the thermal infrared channels of MODIS and ASTER such as radiance at sensor, radiance at surface, surface temperature and surface emissivity. Similar products are being produced by instruments on-board other satellite platforms such as AVHRR and the European ATSR. It is essential that these products are validated to ensure the instruments and the standard product algorithms are functioning correctly.

In-flight validation of thermal infrared data is well established. Currently, this involves mounting validation campaigns in which researchers from several institutions make various ground and atmospheric measurements. The data from these campaigns are then used to propagate the surface radiance through the atmosphere to derive a radiance that can be compared directly with the radiance derived by the satellite- or aircraft- mounted sensor. In addition, the satellite- or aircraft derived sensor radiance can be compensated for atmospheric effects, using the data acquired in the campaign, to derive a surface radiance, temperature or emissivity that can be compared with the corresponding parameter measured on the surface. The primary difficulty with this validation approach is it results in a very limited number of seasonally restricted validation datasets. This difficulty arises for three reasons. First it is extremely difficult to mount large campaigns on a regular basis throughout the year. Second the orbit configuration of the instruments limits the number of times an area can be imaged in a given time interval. Third the season with the greatest chance of resulting in cloud-free data over the validation site must be selected in order to maximize resource use. In order to address these limitations we are instrumenting a small number of sites to automatically obtain a basic set of validation data, under a range of atmospheres, throughout the year. The sites selected are L. Tahoe, CA USA, Uardry, NSW Australia, Amburla, NT Australia and Thangoo, WA Australia. Some of the sites are currently utilized for the semi-annual validation campaigns and these would provide an opportunity to supplement the basic validation parameters with additional field and airborne measurements.

The necessary instrumentation is now in place including several accurate and precise thermal infrared radiometers. We will discuss the instrumentation at each site and present

some preliminary results from the new thermal infrared radiometers including comparisons with thermal infrared data from airborne and satellite thermal infrared radiometers.

Acknowledgements

The work described in this paper was carried out in part at the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration as part of the Earth Observing System Mission to Planet Earth Program.

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