Geophysical Research Abstracts
Vol. 15, EGU2013-5001, 2013
EGU General Assembly 2013

Towards a protocol for validating satellite-based Land Surface Temperature: Application to AATSR data

Darren Ghent (1), Philipp Schneider (2), and John Remedios (1)

(1) University of Leicester, Physics and Astronomy, Leicester, United Kingdom (djg20@le.ac.uk), (2) NILU – Norwegian Institute for Air Research, Norway

Land surface temperature (LST) retrieval accuracy can be challenging as a result of emissivity variability and atmospheric effects. Surface emissivities can be highly variable owing to the heterogeneity of the land; a problem which is amplified in regions of high topographic variance or for larger viewing angles. Atmospheric effects caused by the presence of aerosols and by water vapour absorption can give a bias to the underlying LST. Combined, atmospheric effects and emissivity variability can result in retrieval errors of several degrees. If though these are appropriately handled satellite-derived LST products can be used to improve our ability to monitor and to understand land surface and climate change processes, such as desertification, urbanization, deforestation and land/atmosphere coupling. Here we present validation of an improved LST data record from the Advanced Along-Track Scanning Radiometer (AATSR) and illustrate the improvements in accuracy and precision compared with the standard ESA LST product.

Validation is a critical part of developing any satellite product, although over the land heterogeneity ensures this is a challenging undertaking. A substantial amount of previous effort has gone into the area of structuring and standardizing calibration and validation approaches within the field of Earth Observation. However, no unified approach for accomplishing this for LST has yet to be practised by the LST community. Recent work has attempted to address this situation with the development of a protocol for validating LST (Schneider et al., 2012) under the auspices of ESA and the support of the wider LST community.

We report here on a first application of this protocol to satellite LST data. The approach can briefly be summarised thus: in situ validation is performed where ground-based observations are available – being predominantly homogeneous sites; heterogeneous pixels are validated by way of established radiometric-based techniques (Wan and Li, 2008); further insights are provided through intercomparison with retrievals from other satellite sensors; with time-series analysis performed to identify artefacts on an interannual time-scale.

Specifically, we evaluate data from the AATSR instrument which until recently had been providing satellite observations of LST. Both the standard ESA LST product, and an enhanced offline LST product utilising high resolution auxiliary data produced by the University of Leicester (Ghent et al., in prep.) and in the process of being implanted in the Data Processing Model for the upcoming Sea and Land Surface Temperature (SLSTR) instrument on-board Sentinel-3, are assessed. This is a timely undertaking since it enables evaluation of the data record from AATSR – the predecessor to SLSTR, and it provides insights on the effectiveness of the validation protocol in preparation for the launch of Sentinel-3.

References

Ghent, D., Corlett, G., and Remedios, J. Advancing the AATSR land surface temperature retrieval with higher resolution auxiliary datasets, in prep.

Schneider, P., Ghent, D., Corlett, G., Prata, F., and Remedios, J. Land Surface Temperature Validation Protocol, Report to ESA: Report No. UL-NILU-ESA-LST-LVP, 2012

Wan, Z., and Li, Z.-L. Radiance-based validation of the V5 MODIS land-surface temperature product, International Journal of Remote Sensing, 29, 5373-5395, 2008