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Spectrally Adjusted Surface Reflectance and its Dependence with NDVI for pAssive Optical Sensors

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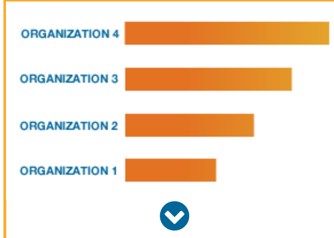

Abstract

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Abstract:
Cross-calibration between sensors is necessary to bring measurements to a common radiometric scale; it allows a more complete monitoring of land surface processes and enhances data continuity and harmonization. However, differences in the Relative Spectral Response (RSR) of sensors generate uncertainties in the process [1]. For this reason, compensating for these differences is of great importance and can be achieved by using a spectral band adjustment factor (SBAF), which establishes a relationship between two spectrally adjusted bands. Nonetheless, this relationship has been shown to depend greatly on the surface type [2] and therefore needs to be corrected. In this work, we compute the SBAF between the historical Landsat and Sentinel 2 sensors by using the RSRs of different passive optical sensors in the Green, Red and NIR bands and the surface reflectance spectral libraries (ASTER, AVIRIS, IGCP) with a wide variety of classes. We produce a quadratic fit of the SBAF vs the surface's NDVI ($\rho_{nir} - \rho_{red}$)/($\rho_{nir} + \rho_{red}$) and propose an exponential correction equation dependent on the NDVI value for both bands. A comparison between Landsat 8 and Sentinel 2 images using the HLS product shows that this method improves the red band and NDVI accuracy by 46.4% and 63.9% respectively when the difference between the Relative Spectral Responses (RSR) is significant, but is inaccurate for the green band, where the

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Contents

I. Introduction

To gain an exhaustive understanding of land surface processes at a variety of scales using remote sensing, it is increasingly necessary to use data from multiple sensors [3]. By combining them we can achieve higher temporal resolutions than using a single one, increasing the monitoring ability of specific parameters. Additionally, the inter-comparison between different sensors of basic parameters such as the surface reflectance is critical to build a consistent database. However, each sensor's bands are located on different ranges of the spectrum, and have a different band efficiency (or Relative Spectral Response) which yield a significant offset in the values measured, even when observing the same target at the same time [4]. The differences in the NDVI value $(\rho_{\rm nir}-\rho_{\rm red})/(\rho_{\rm nir}+\rho_{\rm red})$ between QuickBird and SPOT5, for example, is of 6.3% solely due to their Relative Spectral Response (RSR) discrepancies [5]. It is therefore of great importance to place all of these sensors on a common radiometric scale, especially when a variety of sensor datasets are used to compile a time series of a certain physical parameter covering different sensor generations and sensor types.

Authors

Figures

References

Citations

Keywords

Metrics