Improving the cross-calibration of Landsat8OLI, Sentinel 2 and MODIS sensors through spectral adjustment methods

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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. For this reason, compensating for these differences is of great importance and can be achieved by using statistical regression methods between analogous bands. In this paper, we analyze the difference between different statistical regression functions obtained with the use of a combination of ground, airborne and satellite measurements, on the accuracy of the spectral adjustment for Landsat8, Sentinel 2 and MODIS sensors. In particular, we compare the linear regression intercalibration methods with multilinear regression, a quadratic and a proposed exponential SBAF (spectral band adjustment factor) dependence with the NDVI for the green, red and NIR bands, and the NDVI. We then propose a correction combining the different methods for specific bands. Results on simulated data show that the best performance is obtained from an empirically corrected exponential model, which can improve the uncertainties due to the spectral differences by up to 50% in the green band, 22% in the red band and 32% in the NIR band when the sensors considered have spectrally dissimilar analogous bands.

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