Geophysical Research Abstracts
Vol. 21, EGU2019-8685, 2019
EGU General Assembly 2019

Three-level experiment on Belarusian test site for calibration and validation of satellite data

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Spectral instruments for International Space Station (ISS) are developing in the Department of Aerospace Researches of Belarus State University. Photospectral system (PhSS) and Videospectral system (VSS) are already operating on the ISS and take pictures and spectra of Earth surface in range of 400-1100 nm. For extraction of information about the Earth surface from remote sensing data, it's necessary to do periodical check of spectral instruments stability. Calibration and validation using in situ measurements is one of the way of such check.
For future calibrations of on-board spectral instruments, a test site was organized on the south of Belarus (52.25 N, 31.2 E) were near-nadir measurements from ISS are possible. The site consists of several types of natural and artificial homogeneous surfaces.
A complex of spectral instruments was designed and developed for in situ and airborne measurements of reflection spectra and taking pictures of underlying surfaces. The main instrument is a portable spectrometer that is controlled by a smartphone.
To test on-board calibration techniques and validate measured data, three-level experiment was carried out. In situ measurements at different points of the site were done quasi-synchronously with airborne measurements. In addition, validation with satellite data was done. Sentinel-2B data covering the site territory at the same day with several hours apart was found.
Validation of in situ and airborne measurements was done using LibRadtran calculations. Validation of in situ and Sentinel-2B measurements shows that derived ratios of reflectance measured quasi-synchronously above the same underlying surface are within the total uncertainties, determined by accuracy of absolute instrument calibrations. As the result of performed calibration experiment we can conclude that developed devices and validation technique can be used for calibration of satellite spectral instruments.