Abstract

Spectral reflectance of the Earth surface, obtained from the satellite images, should be independent from the external influences and should reflect the surface properties, specifically the proportion of the radiance reflected from the object. It was proved in this paper that the time series of the 63 images from the Landsat 5 satellite were visibly influenced by the external factors even in the case of the images already atmospherically corrected. These external factors were age of the image and WRS-2 position from which the image was obtained. Age of the image was documented with the steady decrease of the spectral reflectance values of the invariant features, especially in the visible part of the electromagnetic spectrum, caused by the sensor degradation. The influence of the WRS-2 position was documented especially in the infrared bands. The western parts of the images are lighter (have higher values of the surface reflectance) than the eastern parts. That may cause the difference between values when monitoring one spot in two overlapping WRS-2 positions. The method originally used for the relative radiometric normalization IR-MAD was here applied to normalize the surface reflectance data, and resulted in the fact that these influences did not show up any more.

In order to extend the time series of the satellite images it is possible to combine the data from more satellites. In such a case it is important to consider the possible differences in the sensor design of the different satellites. Here the 63 images from the TM sensor of the Landsat 5 satellite were compared with 18 images from the OLI sensor of the Landsat 8 satellite. In the time series of these images of the invariant features the statistically significant difference was proved by applying the normalization IR-MAD method on these data. The images were modified so, that the differences diminished and all the normalized images had the surface reflectance values corresponding to those from the TM sensor.

Key words

Time series, Landsat Level-2, IR-MAD, Thematic Mapper, Operational Land Imager, invariantní prvky, relativní normalizace