Land Surface Temperature (LST) estimation algorithm for MODIS data

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The MODIS instrument measures the upward thermal infrared radiation on 16 channels, with 1 square km surface resolution. These channels are in the 3.5-15 micron wavelength interval, where the emitted terrestrial radiation is dominating. The regions of 3-5 microns and 8-12 microns are athmospheric windows, where radiation has little interaction with athmostpheric gas particles. The determination of LST has two general difficulties. One of them is the effect of surface emissivity on emitted radiation. Measuring the emitted radiation of the surface in a certain wavelength region we can calculate the temperature of the surface using the Planck's law. Since surface materials are not black bodies their emissivity should be taken into account. Another difficulty, due processes in the atmosphere, should also be taken into account. Haze, thin clouds and atmospheric aerosols can heavily change the upward radiation, thus the results of LST calculations, too.

The LST estimation method developed and presented last year has some basic improvement. The LST and the atmospheric parameters, i.e. aerosol optical thickness and effective atmospheric temperature were also estimated using the radiative transfer equations. Nevertheless the improper calculation of the effect of soil water content on soil reflectance made a general error on the calculations. The effect of soil water content is modelled by an exponential function instead of the earlier linear method. This led to more reliable surface temperature data that has good correlation with amateur meteorological observations.