Synergetic in remote sensing technology – joint use of multispectral and microwave data

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In the recent years modeling the behavior of the soil/vegetation system posed the necessity to use data for this system from large variety of sources. This leaded the team to the idea to exploit the features presented by two different types of measuring systems – multichannel spectrometer and microwave radiometer. This synergetic approach allowed studying the soil/vegetation system in larger periods of the growth. Our hypothesis is to use data aquired by passive microwave radiometer to estimate the moisture content in the bare soil during the first weeks of the growth season. After the canopy cover exceeds 40% its state is assessed by data from VNIR multichannel spectrometer. This two-fold approach allowed to develop more precise model of the soil/vegetation system, since the volume of the water accumulated in the soil can be estimated for larger time periods. One possible outcome is to warn the owner if irrigation is essential for some of the cultivated agricultural crops.

For this purpose two measuring systems were designed: a portable field VNIR spectrometer (TOMS) and a passive microwave radiometer (PMR). They operate in conjunction and are trace by type. The technical data of the spectrometer are: 1) number of spectral channels (64÷128); 2) spectral range for measurements (450÷900)nm; 3) period of autonomous registration (1÷30)min; 4) spatial resolution (1÷25)cm^2. The radiometer operates in three different wavelengths, namely 2cm, 6cm and 21cm, which allowed measuring the soil water content up to 2m depth for the regions into which the system was tested.

Both systems are mounted onboard of an unmanned helicopter equipped with GPS and communication system. By this means relatively large areas (flight length max 10 km) were studied.

In this paper presented is the concept synergetic use of a multichannel spectrometric data combined with data from PMR system for creation and validation of new spectral-biophysical models for canopy cover estimation and its state assessment.

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