

Measuring Soil Moisture in Remotely Sensed Images

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The U.S. Geological Survey (USGS) is engaged with the National Environmentally Sound Production Agriculture Laboratory (NESPAL) in Tifton, Georgia, USA, to develop transformations for medium and high resolution remotely sensed images to generate moisture indicators for soil. In the project, NESPAL, in cooperation with the U.S. Department of Agriculture, is providing field-collected soil moisture values for sites in the Little River watershed of southern Georgia, USA. The USGS is providing Advanced Spaceborne Thermal Emission and Reflection (ASTER), Landsat Thematic Mapper (TM), Advanced Land Imager (ALI), and other images covering the field sites collected at specific times, such as before and after rain events and during bare ground conditions. The USGS project team is using and modifying transformations, such as a tasseled-cap transformation for TM and ASTER, and other indices of moisture content in an attempt to match the field-collected values. Initial processing requires re-creation of the radiance values at the sensor and exact geometric rectification to allow an exact pixel location match with the location of the ground sample point. Once this registration is achieved, the transformations can be performed and the match of the moisture values from the image and ground collection can be determined through visual correlation and statistical procedures. Our initial results, based on testing digital numbers, reflectances, radiances, and tasseled-cap transformation values for 10 TM images during a 3-year period indicate a reasonable match for bands 3 and 4 of the tasseled-cap with the ground-collected soil moisture values.