Evaluating Next Generation NASA Earth Science Observations for Image Fusion to Enable Mapping Variation in Soil Moisture at High Resolution

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PROJECT OVERVIEW
The University of Mississippi Geoinformatics Center (UMGC) is conducting a Rapid Prototyping Capability (RPC) project to evaluate the potential of the next generation NASA sensor, Visible Infrared Imager Radiometer Suite (VIIRS), to replace the currently operating Moderate Resolution Imaging Spectroradiometer (MODIS) in the virtual soil moisture sensor (VSMS) generation to improve monitoring soil moisture. The VSMS maps and monitor soil moisture at high spatial (10 m) and temporal (daily) resolution, using both optical and microwave imagery. The study site for the project is 400 km sq km in the semi-environment in Nash Draw, NM (Figure 1).

APPROACH
We have identified three separate experiments in our project. In the first experiment we are evaluating VIIRS to replace MODIS in soil moisture estimation using the Vegetation Index (VI) – Land Surface Temperature (LST) Triangle Model. The second experiment evaluates VIIRS as a replacement for MODIS in a virtual soil moisture sensor (VSMS) generation using multiple regression and artificial neural networks (ANN) with radar imagery. The third experiment evaluates VIIRS as a replacement for MODIS in VSMS generation using the Simulator for Hydrology and Energy Exchange at the Land Surface (SHEELS), a microwave Radiative Transfer Model (RTM) and a neural network-based desegregation model DisaggNet.

Figure 1. Study site (Nash Draw, NM) of the project

Figure 2. RPC Experiment # 1

Figure 3. MODIS derived soil moisture estimation

Figure 4. Comparison between AMSR-E and MODIS derived soil moisture

**EXPECTED IMPACT**

As the MODIS mission nears its end, it becomes essential to evaluate the potential replacement of these products with next generation satellite products to continue soil moisture mapping. National Polar-orbiting Operational Environmental Satellite System (NPOESS) and NPOESS Preparatory Project (NPP) will carry the Visible Infrared Imager Radiometer Suite (VIIRS) sensor. VIIRS is being considered to be the next generation of MODIS. NPP and NPOES are scheduled to be launched in 2009 and 2010, respectively. Successful completion of this project will demonstrate how VIIRS reflectance and thermal data can be used to replace MODIS reflectance and thermal data in the generation of virtual soil moisture sensor (VSMS) for mapping/monitoring soil moisture at high resolution.

**PROJECT STATUS**

All data have been acquired and processed except VIIRS Thermal imagery, which is being simulated by the Stennis team (SSAI-SSC). We expect to receive the data by early May 2008. Our goal is to complete experiment # 1 and 2 by the end of May 2008 and Experiment # 3 by the end of July 2008.

**Contact Information**

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