ADVANCED IMAGE PROCESSING APPROACH FOR ET ESTIMATION WITH REMOTE SENSING DATA OF VARYING SPECTRAL, SPATIAL AND TEMPORAL RESOLUTIONS

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Evapotranspiration (ET) is one of the most important hydrologic parameters for vegetation growth, carbon sequestration, and other associated biodiversity study and analysis. Plant stomatal conductance, leaf area index, canopy temperature, soil moisture, and wind speed values generally correlate well with ET. It is difficult to estimate these hydrologic parameters of vast forest cover through in-situ measurements. But remote sensing has the proven ability for estimating some of those hydrologic and crop growth parameters in a rapid, accurate, and cost-effective manner. Since forest land cover may not be always homogeneous it is more difficult to use remote sensing products to model these ET related hydrologic parameters. The goal of this study is to develop advance image processing approach for developing ET parameter estimation model for different cover conditions like homogenous pine, homogenous switch grass, pine and understory, pine and switch grass multi-cropping, and unmanaged pine forest. The image data produced by different remote sensors on satellite systems have unique characteristics- spatial, spectral, radiometric, and temporal. Image spatial resolution varies with sensors like Landsat 7/8 (30 m), SPOT MSS (10 m) and Panchromatic (5 m), NAIP imagery (1 m) and CIR orthoimageries (0.15 m). Spectral resolution differs with different spectral bands, i.e., Landsat 7 ETM+ with 8 bands, Landsat 8 with 11 bands, SPOT with 5 bands, and aerial sensors with 4 bands. Individual spectral bands has the ability to correctly determine (in our case) different ET parameters more efficiently and accurately. Radiometric resolution refers to the data depth indicative of the sensitivity of the sensor to incoming energy. Temporal resolution refers to the revisit frequency/time of the sensor to a specific location on earth surface, e.g., Landsat revisit time is 16 days over a specific geographic location on Earth. This helps in our ET parameter study better as the changes in ET parameters over time during growth period(s) can be ascertained from remotely sensed Digital Number values and modelled. This study encompasses different study sites such as Parker Tract, Carteret, and Lenoir, NC, Green County, AL, and Calhoun County, MS with different vegetation cover types. The study distinguishes different imagery usage based on their sensor characteristics as discussed with scientific deliberations to develop ET and ET parameter prediction models of the vegetation types. In the process, advanced image analysis protocols are developed for efficient and accurate ET and ET parameter prediction model development.

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