Simulating Visible/Infrared Imager/Radiometer Suite Normalized Difference Vegetation Index Data Using Hyperion and MODIS

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Abstract
The success of MODIS (Moderate Resolution Imaging Spectroradiometer) in creating unprecedented, timely, high-quality data for vegetation and other studies has created great anticipation for data from the Visible/Infrared Imager/Radiometer Suite (VIIRS). VIIRS will be carried onboard the joint NASA/Department of Defense/National Oceanic and Atmospheric Administration NPP (NPOESS) (National Polar-orbiting Operational Environmental Satellite System) Preparatory Project. Because the VIIRS instruments will have lower spatial resolution than the current MODIS instruments at nadir—400 m versus 250 m—for the channels used to generate Normalized Difference Vegetation Index data, scientists need to answer this question: how will the change in resolution affect vegetation studies?

Simulation Approach for VIIRS

- To satisfy the needs of data experiments requiring simulated VIIRS vegetation indices for high temporal frequency regional applications, multitemporal VIIRS red and near-infrared data from must be simulated from MODIS red and near-infrared bands. The initial simulation approach is limited to differences in spatial characteristics between the imaging systems, so PSF (point spread function synthesis) and pixel degradation are applied.
- Initial simulation is based on nadir PSF only.

Two-Tiered Validation

Because no actual VIIRS data exists with which to test the simulation approach, it is necessary to validate with higher spatial/spectral fidelity data.

Next Steps
- Conduct additional validation experiments in areas of extensive large field agriculture and "Gold Standard" sites.
- Update spatial simulation to more closely model the across-track variation of MODIS and VIIRS spatial characteristics.
- Refine metadata to more closely conform to that currently available for MODIS products.

References

Related Poster & Presentation
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**Abstract:**
VIIRS simulations and validations will be based on the Application Research Toolbox, an integrated set of algorithms and models developed in MATLAB® that enables users to perform a suite of simulations and statistical trade studies on remote sensing systems. The hyperspectral and hyperspatial properties of Hyperion data will be used to produce simulated MODIS and VIIRS products. Hyperion-derived MODIS data will be compared with near-coincident MODIS collects to validate both spectral and spatial synthesis, which will ascertain the accuracy of converting from MODIS to VIIRS.

**Subject Terms:**
- remote sensing
- VIIRS
- MODIS
- Hyperion
- NDVI
- vegetation
- simulation