NORMALIZING MEDIUM RESOLUTION NDVI USING LOW RESOLUTION MODIS PRODUCTS

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Abstract: Medium Resolution(10-100m) NDVI (Normalized Difference Vegetation Index) from different sensor systems such as Landsat, SPOT, ASTER, AWifs, CBERS and HJ-1A/1B satellites provides detailed spatial information for studies of ecosystems, vegetation biophysics, and land cover. Trade-offs in sensor designs, cloud contamination or duty cycle limitation, sensor failure and so on highlights the need to integrate NDVI from multiple sensor system in order to create a consistent, long-term NDVI dataset. However, NDVI from different source is distinct for various factors, such as spectral response function, band width, band position, sun-viewer geometry. Some research has studied the relationship between different sensors and gave universal transform model, but it is weak and not very convincing to integrate NDVI from different sensors under different circumstance using the given model. In this paper, the reference-based method was researched to normalize NDVI from different sensor using MODIS products as reference. As the MODIS data products is consistent temporally and spatially with high frequency. It is with potential to apply such a dataset to normalize medium resolution NDVI data from different source. For the nonlinearity between $NDVI_{SR}$ and $NDVI_{DN/TOA}$, the classified-dependency of difference in NDVI between different sensor, and the spatial heterogeneity of atmosphere condition which is an important factor leading the inconsistency between NDVI from different source, local classified liner model was used to convert NDVI from different sensor to MODIS_like_NDVI (MNDVI). Synthetic experiment using simulated MODIS NDVI by upscaling ETM+ surface reflectance as reference to normalize ETM+ $NDVI_{DN/TOA}$ illustrated that local classified linear method performs well compared to other methods. Experiment which integrating NDVI from Landsat ETM+ and ASTER using MODIS as reference was also shown. After normalization, the MNDVI of these two shows great consistency, with R high to 0.93 and MSE low to 0.0008. And the variability showed to be due to the mismatch in the pixel's

footprint between them. Whatever, such reference-based method shows considerable potential to normalize medium resolution NDVI from different sensors, and the local classified method gives great performance. Therefore, NDVI data from different sensors can be combined efficiently by such an approach for time-series, biophysical parameter retrievals, and other downstream analysis.

Keyword: Consistency; NDVI; Multi-sensor; Reference-based method; MODIS;