The MODIS VI Product (MOD13) series: Accomplishments, Refinements, and Validation

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Accomplishments:
- The MODIS Vegetation Index products have been evaluated over a wide range of ecosystems on seasonal and inter-annual time scales to test their performance in providing consistent, spatial and temporal measures of vegetation conditions.

Southwest Time Series Analyses (Arid Semi-arid Ecosystems)
- The temporal dynamics of vegetation in the semiarid and arid Southwest are highly sensitive to anthropogenic and climatic forcings (monsoon pulse, drought, etc.).

Monsoon Pulse

Vegetation Phenology Analysis in Eurasia (Feb. 2000 to Dec. 2001)
- The effects of the current 6-year drought are clearly evident in the MODIS VI Product throughout all ecosystems (desert shrub to montane forest) studied.
- The MODIS VI Product captures the spatial and temporal variability of the climatic drought signal under low biomass (semiarid ecosystems) conditions.

Brazil Amazon and Cerrado Dynamics
- Tapajos EOS core sites show EVI increasing during dry season (“flush” of new leaf growth in agreement with flux tower CO2 results). No saturation.

Algorithm Refinements
- We aim to make algorithm refinements in order to optimize VI product performance and conduct global characterization of the error and uncertainty fields of the VI products in time and space. Some of the major issues include:
  - The same effect on the VI results in false negative values on NDVI and EVI
  - The majority of VI products provide an opportunity to quantify this effect and rectify it.

- Additional examples include:
  - Biomass estimation
  - False positives (e.g., LULC, SAVI, SSMF, SAFARI, Formosat-2)

- We are studying the uncertainty and accuracy of the VI products’ performance through comparisons of independent, self-consistent measures of TOC and NDSI with MODIS-derived VI’s for the global range of spatial-temporal conditions.

- We are evaluating the radiometric stability and accuracy of the VI products by conducting product validation with vegetation indices derived from AWE & MODIS MODIS core sites.

- We will use these data to provide reference data sets summarizing expected MODIS VI products in different climatic conditions, including expected dynamic range and a computing to a biophysically consistent product.

Summary
- The VI products are provisionally validated from radiometric, seasonal, intramural and biophysical perspectives.
- VI product accuracy has been assessed by a number of independent means.
- Data sets used to test the effectiveness of adjusting conditions to those of the product.
- Residual cloud, cloud shadow, BRDF, topography, and snow reduce the largest uncertainties in the VI products.
- Each product has a unique set of advantages and disadvantages that are most apparent when using snow product and BRDF products.
- VI product accuracy varies with QA, enabling the user to decide on level of accuracy necessary for specific applications.