Summary of the CEOS WGCV LPV Vegetation Index Focus Area Workshop
Cambria Hotels & Suites Washington, D.C., USA
10:30-18:00, Wednesday, 12 December 2018

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List of participants

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Participants of the first workshop identified three components of VI validation:

1) Provide uncertainty measures in VI units
2) Provide the information of VI sensitivity to biophysical parameters/conditions (land surface phenology, GPP, LAI, etc.)
3) Provide long-term stability information of VI time series data

This second VI focus area workshop was held to review new VI products, and new VI validation activities and results, and to discuss product inter-comparison protocols to decide a set of standard metrics. A total of 14 presentations were given by participants, followed by a 45-min discussion.

The presentations provided updated information on:

- New and planned VI products
- VI validation results and datasets (PhenoCam, PEN, NPN, UAV, NEON, etc.)
- Near-real-time (NRT) NDVI anomaly detection error evaluation (self-testing)

- Product inter-comparison results (VGT vs. PROBA-V, VIIRS vs. MODIS, Himawari vs. MODIS)

The following new or planned VI products were introduced:

- MODIS and VIIRS NBAR EVI
- Chlorophyll Carotenoid Index (CCI) as an indicator of photosynthetic (GPP) phenology
- Himawari Geostationary Satellite NDVI
- Copernicus Multi-sensor NDVI product
- NOAA JPSS VIIRS temporally-composited VI products

The workshop provided inter-comparison results for the products listed below:

- VITO VEGETATION-1, -2, vs. PROBA-V NDVI continuity/compatibility
- VIIRS NBAR EVI vs. MODIS NBAR EVI
- Himawari geostationary NDVI vs. MODIS polar-orbiting NDVI
- VIIRS daily VIs vs. MODIS daily VIs using near-coincident observations

The workshop discussed that the focus of product inter-comparison was to characterize the differences and their spatial and temporal distribution

- Overall similarity, magnitude of differences and their spatial and temporal patterns
- Suggested measures
    - Product completeness
    - Spatial consistency
    - Statistical consistency
    - Temporal consistency
- Statistical metrics discussed included:
    - RMSD (split into its systematic and unsystematic components)
    - Mean Bias Error, Mean Absolute Error
    - Precision or repeatability

The workshop participants agreed to recommend the statement below:
“CEOS recommends that the validation document of a VI product include:

1) product QA information
2) uncertainty information obtained via validation (NIST-traceability)
3) product inter-comparison results”

The workshop participants agreed to adopt the “time series validation” approach as a standard VI validation methodology where validation focuses on validating the quality of VI time series data as to how well VI products capture seasonal evolution of vegetation. Recommended time series data for this approach include: FLUXNET data (GPP), NPN, Phenocam, and PEN.

The workshop participants identified and agreed on the datasets listed below suitable for characterizing delta VIs:

- Field spectrometer time series data (PEN)

- Opportunistic UAV LTAR data
- Opportunistic NEON data
- Higher resolution satellite data, given that higher resolution satellite data are validated against ground measurements (e.g., Sentinel/Landsat to VIIRS/MODIS/PROBA-V/Sentinal-3)

Validation issues:

- Footprint/scaling issue: simply not sure what they are seeing as what they see are complicated by local topography (e.g., phenocam, due to phenocam sidelook)
- Scaling issue: non-linear with the pixel sizes, but the degree of non-linearity change with surface heterogeneity and should not be so significant
- Geometry: hemisphere vs. directional (PEN camera, PEN HSSR, radiation sensor), nadir vs. off-nadir (NEON hyperspectral data)
- Spectral bandpass differences