CEOS Working Group on Cal/Val
Land Product Validation (LPV) Sub Group:
Essential Climate Variables and SLI

Miguel Román (NASA GSFC) – Vice-Chair
Gabriela Schaepman-Strub (University of Zurich) - Chair
LPV Focus Area Leads

Land Product Validation (LPV)
Working Group on Calibration and Validation (WGCV)
Committee on Earth Observation Satellites (CEOS)

2014 HyspIRI Product Symposium: June 4-6, 2014

http://lpvs.gsfc.nasa.gov/

Announcing...

2014 Recent Advances in Quantitative Remote Sensing, 22 - 26 Sep 2014, Valencia, Spain. Abstract submission deadline, 28 Feb 2014.

37th CEOS WGCV-36, Frascati, Italy, Feb 17-21, 2014.

GV2M: Global Vegetation Monitoring and Modelling, 3rd - 7th Feb 2014, Palais des Papes, Avignon, France.

7th EARSeL Workshop on Land Ice and Snow, Feb 03 - 06, 2014, Bern, Switzerland.

Land Product Validation & Evolution workshop, Jan 28-30, 2014, Frascati, Italy.

LPV Mission

To foster quantitative validation of higher-level global land products derived from remote sensing data and to relay results so they are relevant to users

The value of satellite derived land products for science applications and research is dependent upon the known accuracy of the data. The Committee on Earth Observation Satellites (CEOS), the space arm of the Group on Earth Observations (GEO), plays a key role in coordinating the land product validation process. The Land Product Validation (LPV) sub-group of the CEOS Working Group on Calibration and Validation (WGCV) aims to address the challenges associated with the validation of global land products. The LPV subgroup activities are divided up into 8 focus areas related to product families; biophysical, surface radiation/albedo, fire/burn scar detection, land cover mapping, land

LPV Structure - Focus Areas

* ECV

Snow cover (T5)*, Ice	Thomas Nagler (ENVEO, Austria)	Tao Che (Chinese Academy of Sciences)
Surface radiation (Reflectance, BRDF, Albedo (T8)*)	Crystal Schaaf (U. Massachusetts)	Xavier Ceamanos (Meteo France)
Land cover (T9)*	Pontus Olofsson (Boston University)	Martin Herold (Wageningen University, NL)
FAPAR (T10)*	Arturo Sanchez-Azofeifa (U. Alberta)	Nadine Gobron (JRC, IT)
Leaf area index (T11)*	Oliver Sonnentag (U Montreal)	Stephen Plummer (Harwell, UK)
Fire (T13)* (Active Fire, Burned Area)	Luigi Boschetti (University of Idaho)	Kevin Tansey (University of Leicester, UK)
Land surface temperature*	Simon Hook (NASA JPL)	Jose Sobrino (University of Valencia, SP)
Soil moisture*	Tom Jackson (USDA)	Wolfgang Wagner (Vienna Uni of Technology, AT)
Land surface phenology	Matt Jones (U of Montana)	Jadu Dash (University of Southampton, UK)

Supported by Jaime Nickeson, NASA GSFC

CEOS LPV Strategy

- Space agencies increasingly invest in validation efforts of products.
- CEOS LPV mission is to foster and coordinate validation (intercomparison and validation with reference data) **across products.**
- Support independent operational validation efforts (in situ data collection and archiving; common reference, metrics, reporting; and transparency towards users).
- Major contributions through product PIs, mission Cal/Val teams, and Universities.

LPV Working Flow – Product Specific!

1. Good practice protocols
   - Product definitions
   - Intercomparison guides (eg. spatial, temporal resolution of different products, metrices, reporting)
   - Validation guide (eg. spatial sampling of in situ data, heterogeneity tests)
2. Identification of (in situ) reference data sets
3. Online platform(s) with standardized output for intercomparison and validation
4. Evaluate and develop *new* validation methods

In situ networks

Experts

International structures

User/CS community

LPV Activities relevant to HysplRI and SLI

HyspIRI / SLI Products

LPV Focus Group / Product	VSWIR L 2/ 3	VSWIR L4	VSWIR Global	TIR L4	SWIR / TIR
LAND COVER					
Fractional land cover / veg. cover					
Disturbance, PFT, hazard susceptibility					
SURFACE RADIATION					
Surface Reflectance					
Surface Albedo					
BIOPHYSICAL					
Gross / Net Primary Production					
fPAR					
LAI					
Water content, LUE, Pigments					
FIRE					
Detection of Fire events					
Fire fuel loads					
LAND SURFACE TEMPERATURE					
LST					
Emissivity					
Evapotranspiration					

Existing Val Methods

Research Required

Good Practice Protocols: Status and Updates

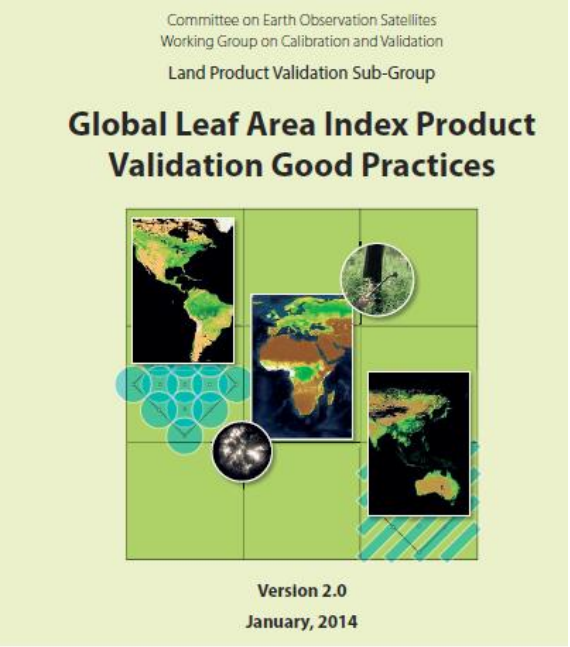
T11 - Leaf area index: Good practices Version 2 released during ESA/ESRIN workshop in January, 2014.

T10 - FAPAR: Validation concept presented during FAPAR workshop at JRC. Leads are working on a workshop report.

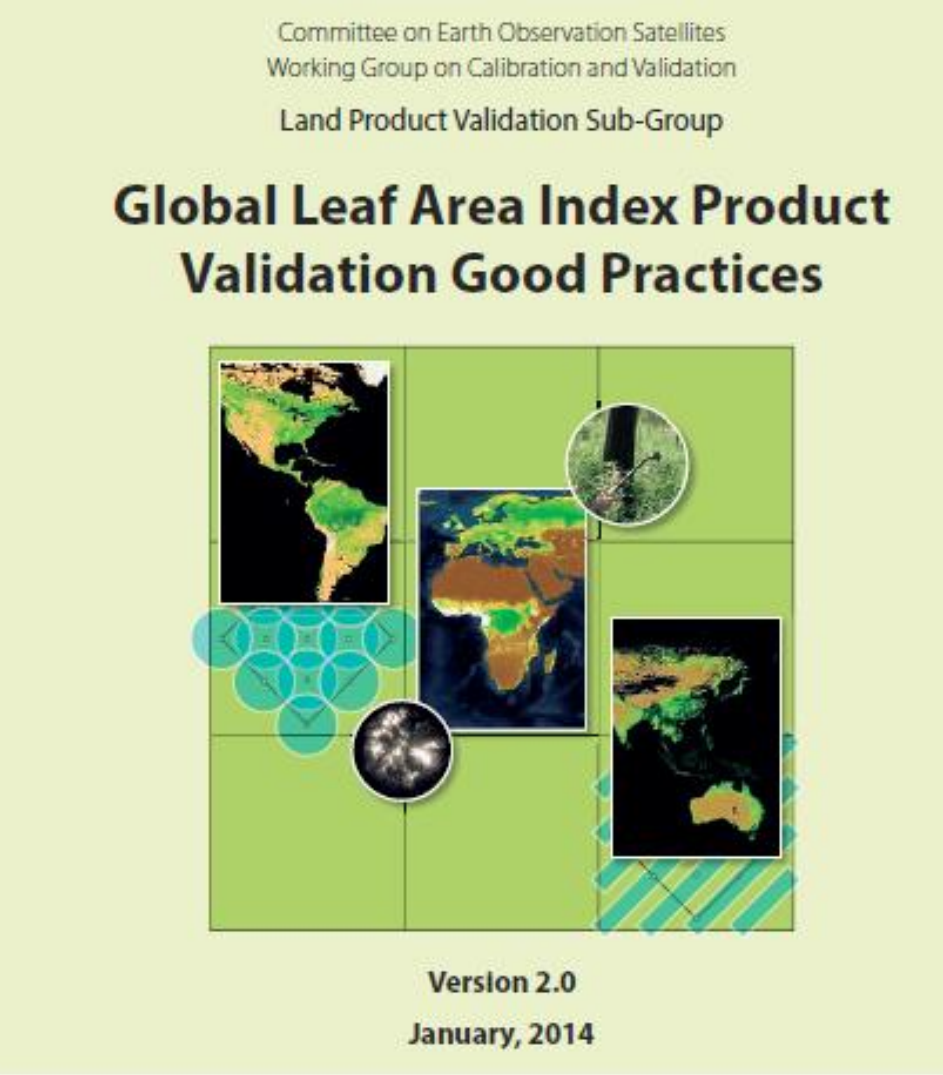
T8 - Albedo: Working on analysis of representativeness of CEOS LPV sites. Draft outline to be completed by end of year.

T9 - Land cover: Good practices for estimating area and assessing acuracy of land 'change maps' (Olofsson et al. 2014) published in RSE.

T5 - Snow cover: Methods for validation and intercomparison of snow extent will be presented and discussed at the ISSPI workshop in July.



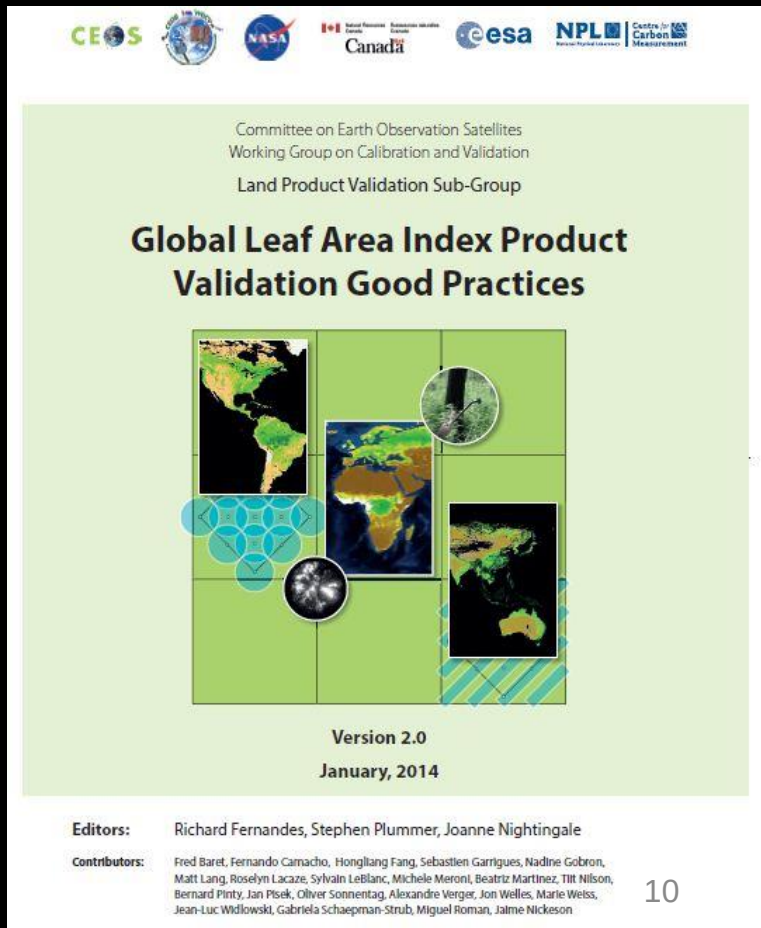
LAI Validation Good Practices Version 2



- Printed version
- Online version now on LPV website
- Reviewer comments and responses on LPV website
- Living document

Validation Methods

- Direct – harvesting
- Indirect – gap fraction determination
  - LAI-2000 (blue diffuse observations)
  - Ceptometer/DEMON/TRAC (PAR direct or diffuse observations)
  - DHP (camera quality)
- Indirect – allometry
- Indirect – spectral reflectance/spectrometry
- Indirect - Lidar
- Planned in situ methods review – Oliver Sonnentag!!
- How to scale up/sampling – see Guideline
- Establish CEOS standard set of sites (common with albedo, fapar, LAI and land cover??)
- Interface with infrastructural networks (NEON, TERN, ICOS, others?)
- Augment with synthetic testing (algorithm intercomparison exercises) - Widlowski



Sampling

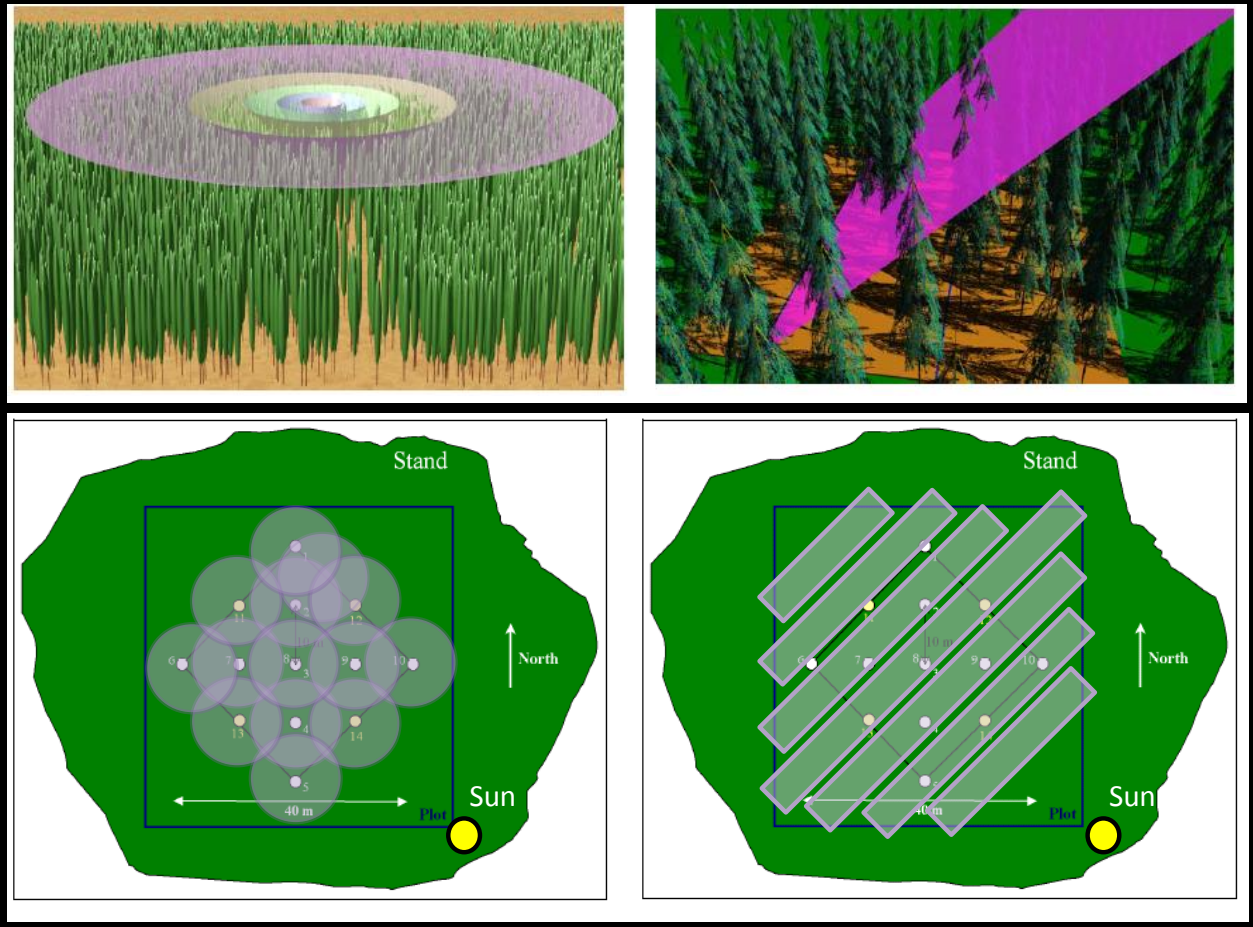


Figure 3: Spatial footprints of LAI-2000 (left) and TRAC (right) measurements following the CCRS sampling scheme (adapted from (Leblanc 2005c, Leblanc 2008)) for overstory LAI for a 40mx40m ESU. LAI-2000 footprints determined by canopy height while TRAC footprints are determined both by canopy height and solar zenith angle. Only every second TRAC footprint shown for clarity.

Upscaling

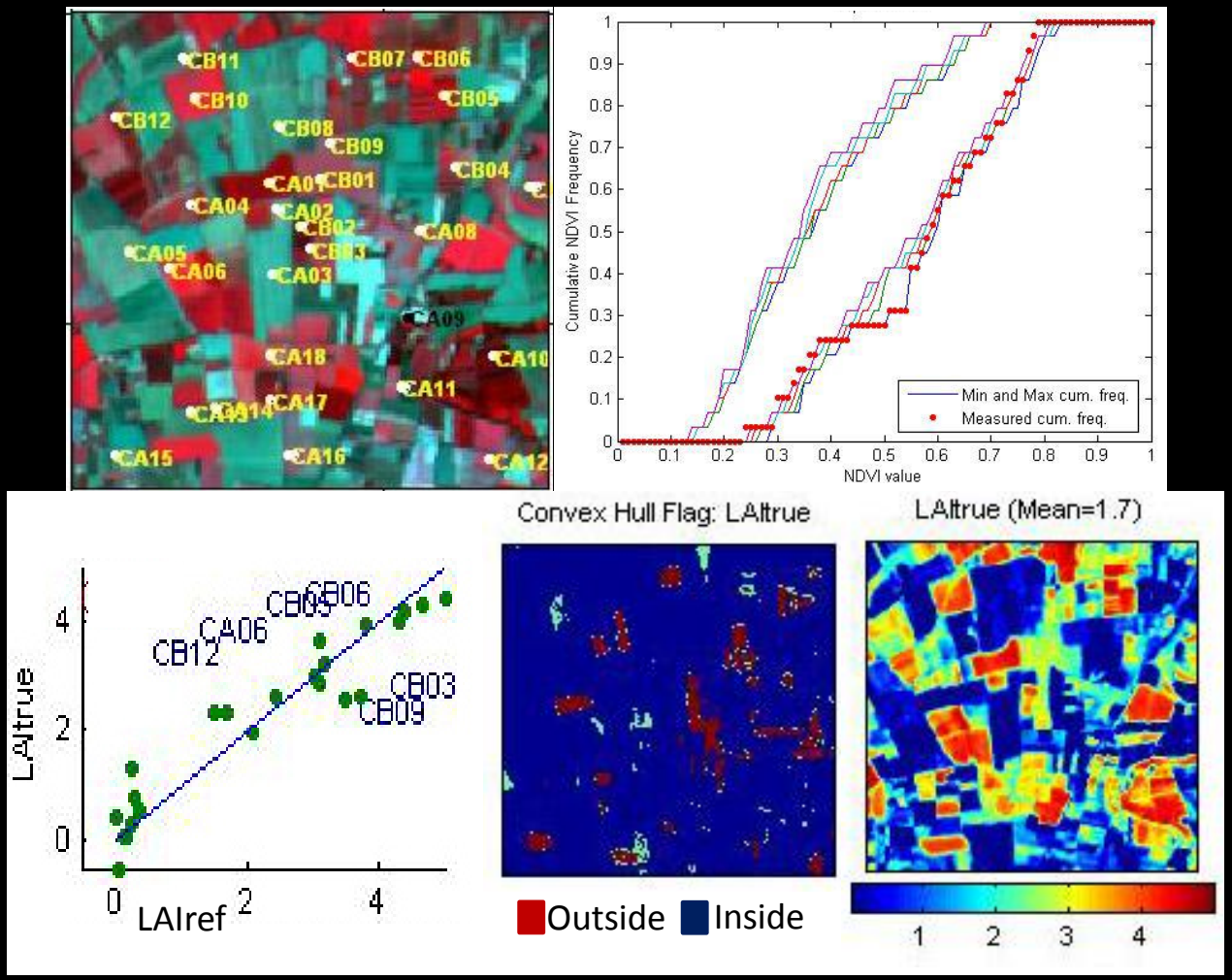


Figure 6: Outputs of VALERI reference LAI mapping process. Left panel shows scatter plot of predicted versus actual LAI based on robust linear regression. Outliers are indicated as alphanumeric symbols. Centre panel shows mask of areas within (blue) and outside (red) spectral convex hull of ESU data. Right panel shows final reference LAI map.

OLIVE – Online Validation Exercise (CEOS Cal/Val Portal)

CalVal Home

- Overview
- Instruments
- Sites
- Documentation
- Cal/Val Campaigns & Events
- Tools
- Projects
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YOU NEED TO BE A CAL/VAL REGISTERED USER TO USE OLIVE. PLEASE REGISTER HERE

WELCOME TO OLIVE

The **O**n **LI**ne **V**alidation **E**xercise is a web service designed to:

- Quantify the performances of Earth observation land products (LAI, FAPAR, and FCOVER)
- Use transparent and traceable methods following standards defined by the CEOS (**C**ommittee on **E**arth **O**bservation **S**atellites) - LPV (**L**and **P**roduct **V**alidation)subgroup
- Provide open access of the results to the whole scientific community.
- Capitalize on the several initiatives undertaken within the community.

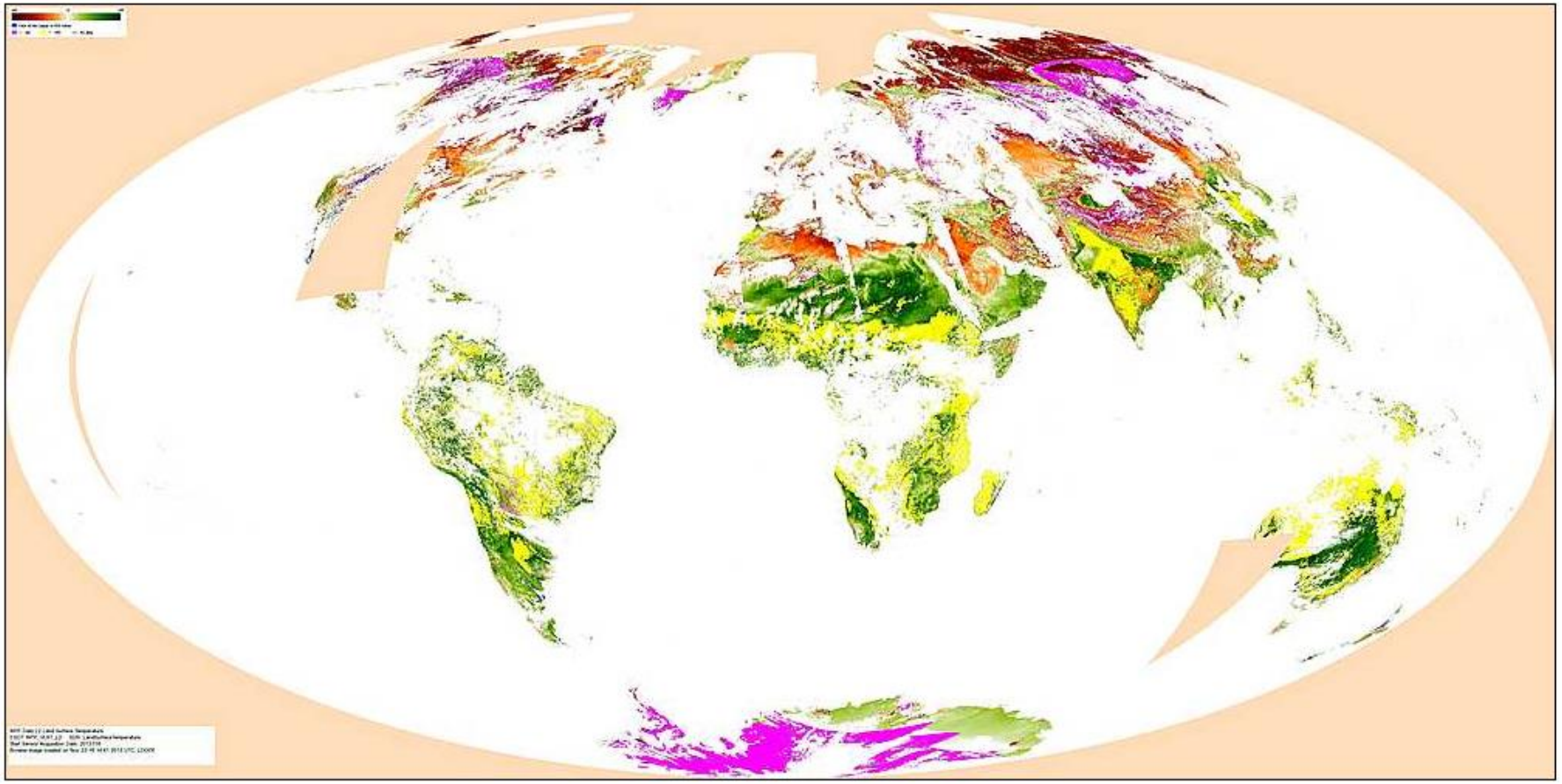
OLIVE is fully supported by the CEOS/LPV subgroup and allows to reach stage 2 and 3 of the validation process: it allows to estimate product accuracy over a significant set of locations and time through an inter-comparison exercise between existing products. Product uncertainty is quantified using reference in situ data over multiple location data representative of the Earth's surface. OLIVE is expected to help reaching the stage 4 of the validation process thanks to regular updates and to an increasing participation of the scientific community.

The scientifc community is thus largely encouraged to use OLIVE to validate and inter-compare a new product to the existing ones. A validation exercise can be achieved in a private mode (results only accesible to user) or public (access to the whole OLIVE community).

OLIVE is still running in beta mode, the CEOS/LPV approval being still in process. Feedback, recommendations and suggetsions are very welcomed. Please, contact the OLIVE team at: Alessandro.Burini@esa.int

ACCESS TO OLIVE HERE

Recent Product Evaluations:
Global Absolute Difference in LST (MODIS vs VIIRS), 2013.319

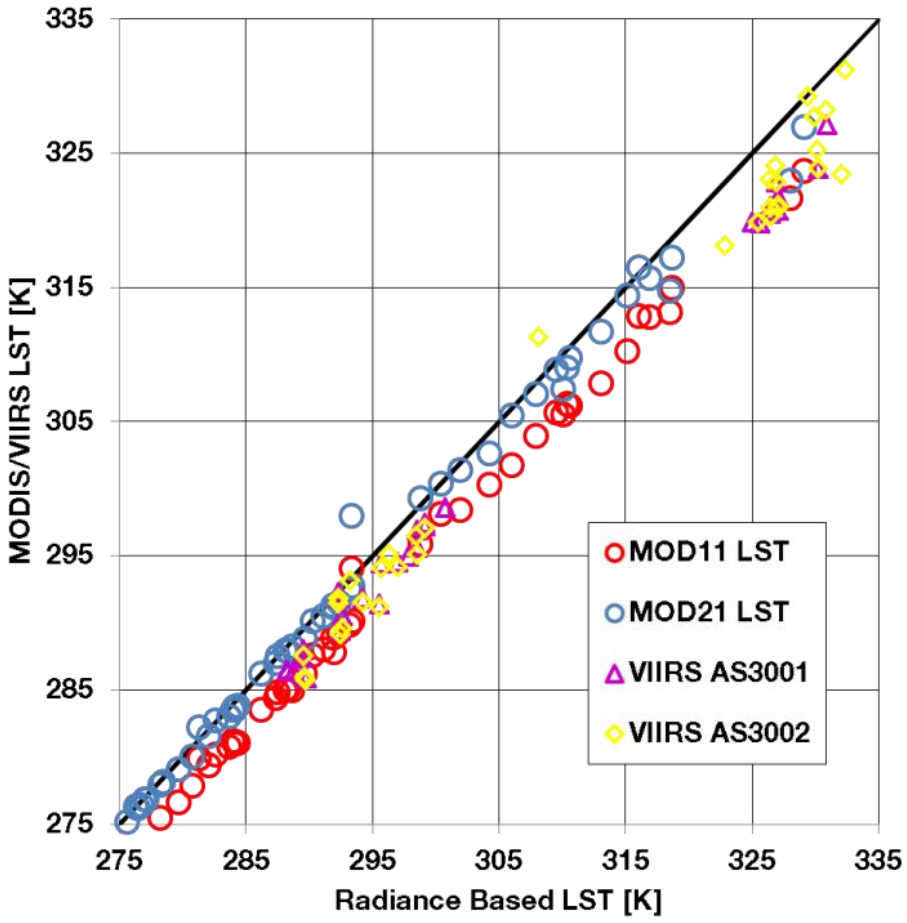


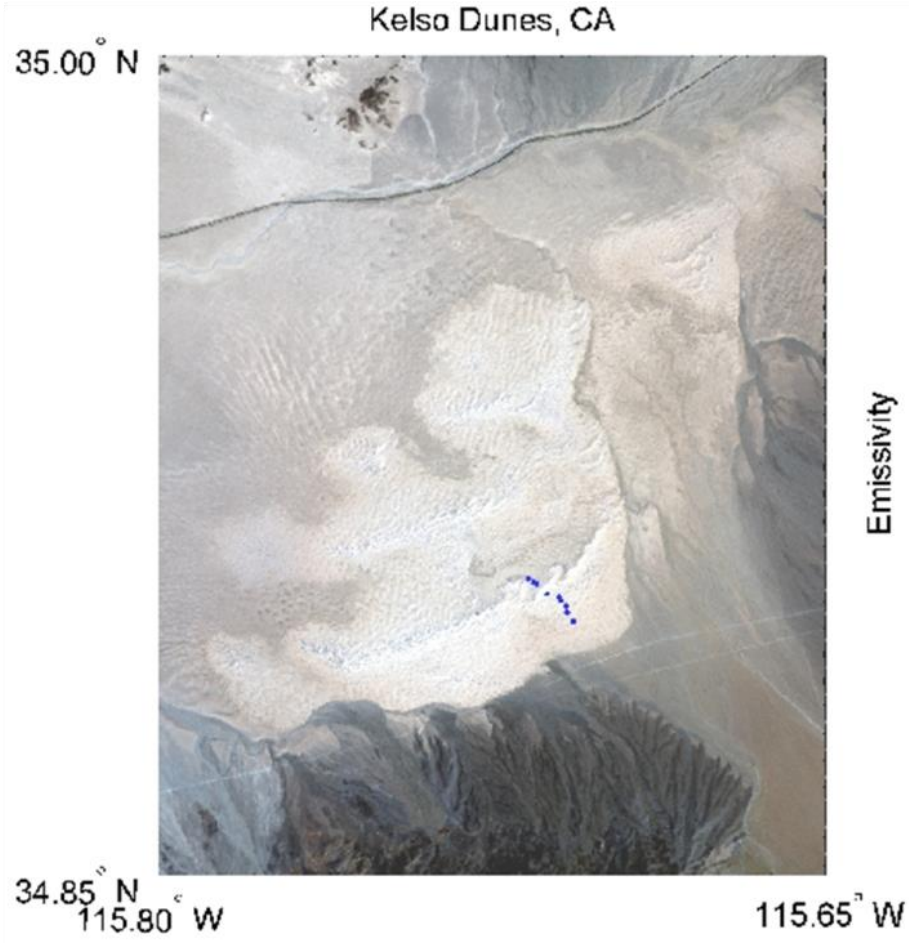
S. Devadiga (GSFC/LDOPE)

IDPS Mx8 version of the LST algorithm was recently found to underestimate the LST nearly for all of the surface types. LST generated from the previous IDPS build (Mx72) using Mx8 coefficient matches the current IDPS version. Thus, the surface type based coefficients are the source of the error in retrieved LST.

Evaluation of the VIIRS Land Surface Temperature (LST) EDR

The generation of an VIIRS LST product compatible with MODIS (i.e., a merged product using both split-window and dynamic emissivity retrieval) will result in a much more stable EDR.





MODIS/VIIRS LST at the Kelso Dunes, California, pseudo-invariant site (right) versus radiance-based LST.

from Simon Hook (JPL)

Thank you!

ESA, NASA
USGS, USDA
NR Canada
Chinese Academy of Sciences
University of Zurich
University of Massachussetts
Boston University
University of Montana
University of Southampton
Wagningen University
JRC
Vienna University of Technology
University of Valencia
University of Alberta
University of Leicester
University of Idaho