vegetation parameters cci

CCI+ Vegetation Parameters

Product User Guide CRDP-1

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LIST OF ACRONYMS

AD	Automatic Differentiation
AMMA	Analyse Multidisciplinaire de la Mousson Africaine
ASTM	American Society for Testing Materials
ATBD	Algorithms Theoretical Basis Document
B	mean Bias
BHR	Bi-Hemispherical Reflectance
BRDF	Bidirectional Reflectance Distribution Function
BRF	Bi-directional reflectance
C3S	Copernicus Climate Change Service
CCI+	Climate Change Initiative Plus
CDR	Climate Data Record
CEOS-LPV	Committee on Earth Observation Satellites (Land Product Validation subgroup)
CGLS	Copernicus Global Land Service
CRDP	Climate Research Data Package
DHR	Directional-Hemispherical reflectance
DN	Digital Number
E3UB	ECV End-to-End Uncertainty Budget
EBF	Evergreen Broadleaf Forest
ECV	Essential Climate Variable
ED	External Document (as listed in section 1.3)
ERR	Refers to the uncertainty layer of a variable
ESA	European Space Agency
fAPAR	***f***raction of Absorbed Photosynthetically Active Radiation
GBOV	Ground-Based Observations for Validation
GCOS	Global Climate Observing System
HDR	Hemispherical-Directional reflectance
ID	Internal Document (as listed in section 1.3)
LAI	Leaf Area Index
NASA	National Aeronautics and Space Administration
NIR	Near Infra-Red range of the electromagnetic spectrum, here 700--2500 nm
NLF	Needleleaf Forests
PAR	Photosynthetically Active Radiation
PROBA-V	PRoject for On-Board Autonomy – Vegetation instrument
PROSPECT	PROperties of leaf SPECTtra
PUG	Product User Guide
PVASR	Product Validation and Algorithm Selection Report
PVIR	Product Validation and Intercomparison Report
PVP	Product Validation plan
RMSD	Root Mean Square Deviation
SAIL	Scattering of Arbitrarily Inclined Leaves
SPOT	Système Pour l'Observation de la Terre
TARTES	Two-streAm Radiative TransfEr in Snow
TIP	Two-stream Inversion Package

TOA	Top-Of-Atmosphere
TOC	Top-Of-Canopy
URD	User Requirements Document
VGT	VEGETATION instrument
VIS	VISible range of the electromagnetic spectrum, here 400–700 nm
VP	Vegetation Parameters
WGCV	Working Group on Calibration and Validation

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1 Introduction

1.1 Scope and Objectives

The Product User Guide (PUG) is a primary document that gives an overview of the product characteristics in terms of algorithm, technical characteristics, and main validation results.
The current version of the document is valid for CRDP-1.

1.2 Content of the document

The document is structured as follows:

- Chapter 2 presents a description of the algorithm.
- Chapter 3 describes the technical characteristics of the product.
- Chapter 4 summarizes the main results of the quality assessment.
- Chapters 5, 6 and 7 provide information on software tools, data policy and access.

1.3 Related documents

Internal documents

Reference ID	Document
ID1	Climate Change Initiative Extension (CCI+) Phase 2 New ECVs: Vegetation Parameters – EXPRO+ (ITT)
VP-CCI_D1.1_URD_V1.1	User Requirement Document: fAPAR and LAI, ESA CCI+ Vegetation Parameters https://climate.esa.int/media/documents/VP-CCI_D1.1_URD_V1.1.pdf
VP-CCI_D2.1_ATBD_V1.3	Algorithm Theoretical Basis Document: fAPAR and LAI, ESA CCI+ Vegetation Parameters http://climate.esa.int/media/documents/VP-CCI_D2.1_ATBD_V1.3.pdf
VP-CCI_D2.2_E3UB_V1.0	End-to-end ECV Uncertainty Budget: fAPAR and LAI, ESA CCI+ Vegetation Parameters http://climate.esa.int/media/documents/VP-CCI_D2.2_E3UB_V1.0.pdf
VP-CCI_D1.3_PVP_V1.1	Product Validation Plan: fAPAR and LAI, ESA CCI+ Vegetation Parameters http://climate.esa.int/media/documents/VP-CCI_D1.3_PVP_V1.1.pdf
VP-CCI_D2.4_PVASR_V1.1	Product Validation and Algorithm Selection Report: fAPAR and LAI, ESA CCI+ Vegetation Parameters http://climate.esa.int/media/documents/VP-CCI_D2.4_PVASR_V1.1.pdf
VP-CCI_D4.1_PVIR_V1.2	Product Validation and Intercomparison Report: fAPAR and LAI, ESA CCI+ Vegetation Parameters http://climate.esa.int/media/documents/VP-CCI_D4.1_PVIR_V1.2.pdf

External documents

Reference ID	Document
CCI Data Standards	ESA Climate Office, CCI Data Standards v2.3 (CCI-PRGM-EOPS-TN-13-0009
C3S_ATBD_SA	C3S ATBD of Surface Albedo, multi-sensor, D1.3.4-v2.0_ATBD_CDR_SA_MULTI_SENSOR_v2.0_PRODUCTS_v1.1

2 Vegetation Parameters Products

2.1 Products definition

LAI and fAPAR are the main products that are delivered in the CRDP-1. The retrieval methodology allows to retrieve at the same time several other variables. A selection of those is also included in the sites dataset of CRDP-1. The selection includes Surface Albedo (DHR and BHR), Chlorophyll *a*+*b* leaf pigment concentration and the fAPAR associated with Chlorophyll *a*+*b* (fAPAR_Cab).

Leaf Area Index (LAI) is defined as the total one-sided area of all leaves in the canopy within a defined region, and is a non-dimensional quantity, although units of [m^2/m^2] are often quoted, as a reminder of its meaning [GCOS-200, 2016]. The selected algorithm in the CCI-Vegetation Parameters project uses a 1-D radiative transfer model, and LAI is uncorrected for potential effects of crown clumping. Its value can be considered as an effective LAI, notably the LAI-parameter of a turbid-medium model of the canopy that would let the model have similar optical properties as the true 3-D structured canopy with true LAI [Pinty et al, 2006]. Additional information about the geometrical structure may be required for this correction to obtain true LAI [Nilson, 1971], which involves the estimation of the clumping index, CI, defined as the ratio between the true and effective LAI [see Fang, 2021 for a review of methods to estimate CI].

Fraction of Absorbed Photosynthetically Active Radiation (fAPAR) is defined as the fraction of Photosynthetically Active Radiation (PAR; solar radiation reaching the surface in the 400-700 nm spectral region) that is absorbed by a vegetation canopy [GCOS-200, 2016]. In contrast to LAI, fAPAR is not only vegetation but also illumination dependent. In the CCI-Vegetation Parameters project we refer to fAPAR as the white-sky value (i.e. assuming that all the incoming radiation is in the form of isotropic diffuse radiation). Total fAPAR is used and no differentiation is made between live leaves, dead foliage and wood.

Fraction of Chlorophyll Absorbed Photosynthetically Active Radiation (fAPAR_Cab) is defined as the fraction of Photosynthetically Active Radiation (PAR; solar radiation reaching the surface in the 400-700 nm spectral region) that is absorbed by the chlorophyll *a* and *b* molecule in a vegetation canopy.

Surface albedo describes some of the reflectance properties of the surface. Here, we produce bi-hemispheric reflectance (BHR) for diffuse illumination with a reference spectrum for spectral broadband intervals VIS (400— 700 nm), NIR (700—2500 nm), and SW (700—2500 nm), as well as directional-hemispherical reflectance (DHR) for the same spectral broadbands, computed for local solar noon.

Chlorophyll-*a*+*b* leaf pigment concentration is the amount of Chlorophyll *a* and *b* molecules per unit leaf area, typically measured in ug.cm-2.

2.2 Input data

Top-of-Canopy (TOC) reflectances with associated uncertainties of SPOT4/5-VGT1/2 and Proba-V (Figure 1) are used as input for CRDP-1. These TOC reflectances are intermediate products from the multi-sensor Surface Albedo dataset. A description of the processing steps can be found in the Surface Albedo ATBD (C3S_ATBD_SA).

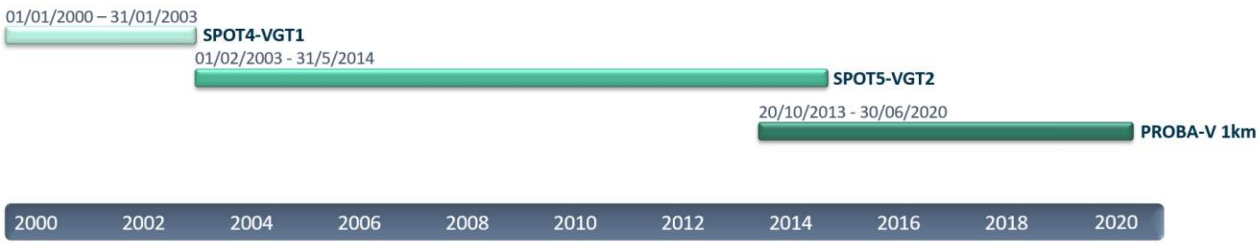

Figure 1: Period for which each sensor is used in CRDP-1.

2.3 Retrieval methodology

2.3.1 Processing chain

Figure 2 shows a schematic overview of the overall processing chain. The processing chain starts from the Top-of-Atmosphere (TOA) reflectance of various sensors. In the first step, the data are projected to a common grid and the images are corrected for atmospheric perturbation. Next, all TOC reflectances that are within an observation window are evaluated and the selected observations are used in the OptiSAIL retrieval method. OptiSAIL and the combination of OptiAlbedo and TIP were compared in terms of accuracy, processing performance and adequacy to the user requirements. OptiSAIL was selected due to its overall outperformance of OptiAlbedo-TIP in the validation and the qualitative user requirements. The full results are described in the VP-CCI_D2.4_PVASR.
Note that for CRDP-1, the first step of the processing was already done (see section 2.2).

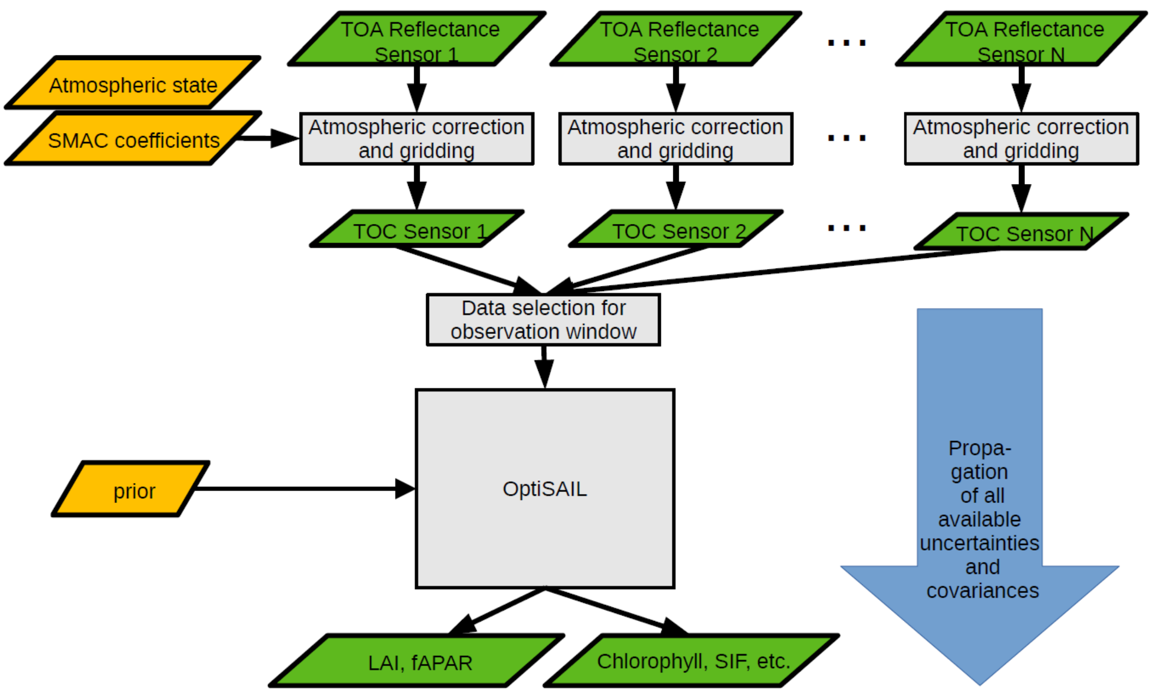

Figure 2: Schematic overview of the processing chain.

2.3.2 Description of retrieval methodology

OptiSAIL is a retrieval and error propagation framework and uses automatic differentiation for gradient, Jacobian and Hessian computations. It is built around the established components 4SAILH (Scattering of Arbitrarily Inclined Leaves, with 4-stream extension and hot-spot, Verhoef et al., 2007), PROSPECT-D (simulation of leaf spectra, version D including senescence, Féret et al. 2017), TARTES

(Two-streAm Radiative Transfer in Snow (Libois et al. 2013), with the addition of an empirical soil reflectance model, a semi-empirical soil moisture model (Philpot 2010), the Ross-Thick-Li-Sparse BRDF model, and a cloud contamination simulation. They directly simulate TOC reflectances for given sets of spectrally invariant parameters (e.g. LAI, leaf pigments etc.) and scene geometries at given bands. In order to retrieve these parameters for observed TOC reflectance data, an inversion is made for each pixel. During cycle-1 of this project, repeatedly cloud-contaminated data was encountered, which was not flagged as such. Therefore, the cloud contamination model of OptiSAIL was activated, which simulates the effect of variable amounts of thin clouds per observation. This significantly reduces the number of outlier retrievals (VP-CCI_D2.4_PVASR). The inversion in OptiSAIL minimises a cost function with data and prior term. It uses gradient information which is efficiently provided by adjoint code of the models. These adjoint codes are obtained by Automatic Differentiation (AD), which allows for quick adaption of the whole system to changes in the models.
Figure 3 gives an overview of the reflectance simulation and Figure 4**Error! Reference source not found.** of the retrieval framework. More details can be found in the ATBD (VP-CCI_D2.1_ATBD). The model is also described with further references and demonstrated in Blessing et al. (2021).

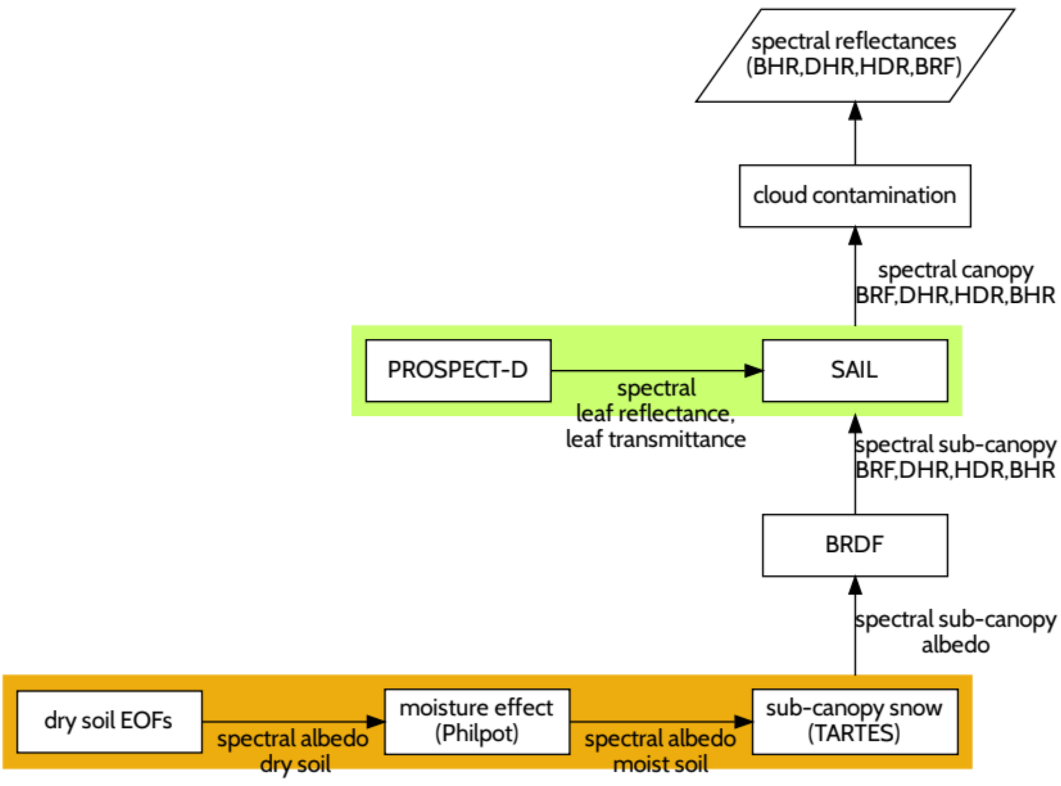

Figure 3: OptiSAIL reflectance simulation.

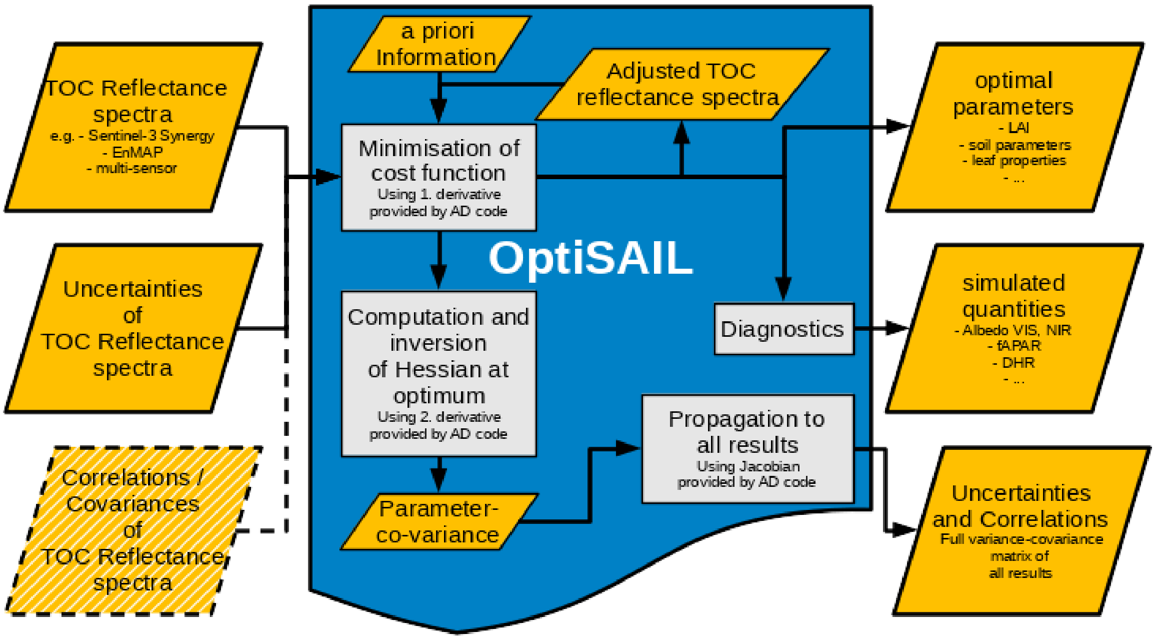

Figure 4: OptiSAIL retrieval framework with covariance propagation.

2.4 Limitations

Even though the inputs to OptiSAIL are filtered for outliers, it can happen that circumstances such as high aerosol optical thickness, varying surface state (melting snow), or a persistent cloud cover leads to a poor retrieval. The ATBD lists a few options to filter out such results, using either a pre-defined set of filter conditions from the invcode RETR_LOW_QUALITY, or tailor their own to suit their specific needs. If time series are extracted from the data set, then it is possible to apply smoothing and gap filling using harmonic analysis or splines to eliminate outliers due to poor retrievals or to fill gaps. This can be a useful step before application in phenology studies or assimilation in DGVM's. It is considered a post processing step: It is not part of the retrieval algorithm to prevent the elimination of potentially meaningful signals in the data. In this respect the product is different from a smoothed data product such as CGLS-V2.

Ideally and by their definitions, LAI and fAPAR are model independent, however, model formulation dependence cannot be eliminated. The algorithm uses the four-stream 'Scattering of Arbitrarily Inclined Leaves (SAIL) model with hotspot representation. This is a powerful and computationally efficient radiative transfer model for vegetation, which considers the vegetation as horizontally homogenous layers with a variable leaf orientation distribution. This model is selected because it strikes a balance between being constraint by observations without the need for biome-specific ancillary data on the one hand and representing the most relevant optical properties of vegetation on the other hand. The model does not represent specific crown shapes or sparse vegetation clustered at sub-pixel scales. The retrievals represent the effective LAI of an idealized, homogeneous vegetation with the observed reflectance. This may cause an underestimate of the true LAI in forests ecosystems. This can be corrected for in a post processing step using a biome specific clumping factor. fAPAR in forests is slightly underestimated for the same reason.

The inversion also uses the PROSPECT-D model for leaf optical properties (Feret et al, 2017), and hence the products, in particular fAPAR-Cab and Cab, rely on the specific absorption spectra calibrated for this model.

In some situations, individual model parameters may not be well constrained by the observations. For instance, the leaf chlorophyll content for a very sparse canopy has little to no influence on the overall reflectance. In such cases, the data will show retrieved values very close to the temporally and spatially invariant prior, with an uncertainty close to the prior uncertainty. This needs to be kept in mind, if for instance time series leaf chlorophyll content at northern hemisphere deciduous forest sites are interpreted. In such case a meaningful time series can be obtained by computing the canopy chlorophyll content as the product of LAI and leaf chlorophyll content
Only the products of LAI and fAPAR have been validated. The products fAPAR-Cab, Cab and the albedo products have not been validated.

3 Product properties

3.1 Product content

The CDR (Climate Data Record) Essential Climate Variable (ECV) Vegetation Parameters dataset is a merged product that includes the thematic products listed below. The first version (CRDP-1) are distributed as 10° x 10° tiles for a N-S transect over Europe and Africa, and for a number of globally distributed sites (see Figure 5 and Figure 6 in section 3.5.2 and Annex A).

The tile products contain the layers listed in Table 1. The site products contain the same thematic products as the tile products, but additionally also those listed in Table 2.

Table 1: Thematic products included in the tile and site dataset (8 layers).

Parameter	Meaning
LAI	SAIL effective Leaf Area Index
fAPAR	fraction of Absorbed Photosynthetically Active Radiation using diffuse ASTM-G0173
LAI_ERR	LAI standard error
fAPAR_ERR	fAPAR standard error
LAI_fAPAR_correl	LAI fAPAR standard correlation
n_bands_used	number of bands used (see section 3.4.1)
p_chisquare	Probability of Chi-square statistics; low values mark bad correspondence of model and data
Invcode	Inversion code (see section 3.4.2)

Table 2: Additional thematic products included in the sites dataset only (60 additional layers).

Parameter	Meaning
fAPAR_Cab	fAPAR absorbed by Chlorophyll a+b
Cab	PROSPECT-D leaf chlorophyll a+b content
BHR_VIS	bi-hemispherical reflectance (albedo) in the visible rang
BHR_NIR	bi-hemispherical reflectance (albedo) in the near infra-red range
BHR_SW	bi-hemispherical reflectance (albedo) in the shortwave range
DHR_VIS	directional-hemispherical reflectance (black-sky albedo), VIS, at local solar noon
DHR_NIR	directional-hemispherical reflectance (black-sky albedo), NIR, at local solar noon
DHR_SW	directional-hemispherical reflectance (black-sky albedo), SW, at local solar noon
<param>_ERR	Standard error of the parameter listed above (8 layers)
<param1>_<param2>_correl	Standard correlation between two parameters (44 layers)

3.2 Filename convention

The filenames of the products follow the CCI Data Standards:

ESACCI-VEGETATION-<Processing Level>-<Data Type>-<Product String>-<Additional Segregator>-<Indicative Date>-fv<File Version>.nc

Where:

- Processing Level: L3S, meaning that the Vegetation Parameters CCI products are super-collated observations from multiple instruments and observations times are combined in a common spatio-temporal grid.
- Data Type: VP_PRODUCTS, meaning that multiple thematic products are combined in the files.
- Product String: MERGED, meaning that data are combined from more than one platform and/or sensor to generate the full time series of the products.
- Additional Segregator: For tiles: tile_XxxYyy (xx and yy according to definition in section 3.5.2)
  For sites: site_<site id>_<site name> (see Annex A)
- Indicative Date: YYYYMMDD format, the date for which the retrieval is valid
- File Version: 1.0

3.3 Format

The Vegetation Parameters products are delivered in compressed Network Common Data Form version 4 (netCDF4) files with metadata attributes compliant with version 1.8 of the Climate and Forecast (CF) conventions and CCI Data Standards (v2.3).

The following sections describe the components of each NetCDF file.

3.3.1 Global attributes

The global attributes (Table 3) provide general information about the products. The attributes include those recommended in the CF standards, and additional attributes from the CCI Data Standards v2.3 and also product-specific attributes.

Table 3: Global attributes

Attribute Name	Attribute Description
title	ESA CCI Vegetation Parameters LAI, fAPAR
institution	Where the data were produced
source	SPOT-VEGETATION and PROBA-V Top-of-Canopy reflectance and uncertainty intermediate data from C3S_312b_Lot5 contract. Description available in https://datastore.copernicus-climate.eu/documents/satellite-albedo/D1.3.4-v2.0_ATBD_CDR_SA_MULTI_SENSOR_v2.0_PRODUCTS_v1.1.pdf
history	Date, name and version of the processing steps applied
references	ATBD: https://climate.esa.int/documents/1953/VP-CCI_D2.1_ATBD_V1.1.pdf
tracking_id	Uuid
Conventions	CF-1.8
product_version	V1.0
format_version	CCI Data Standards v2.3
summary	A summary of the dataset
keywords	Satellite, observation, vegetation, multi-sensor, multi-angular
id	<filename>
naming_authority	vegetation_parameters.esa-cci
keywords_vocabulary	science keywords
cdm_data_type	Grid

comment	For tiles: “tile number = XxxYyy” (with xx and yy according to section 3.5.2), a reference to the tiling grid For sites: “site name = <site name>” (according to Annex A)
date_created	Creation date of the file
creator_name	ESA Vegetation Parameters CCI
creator_url	https://climate.esa.int/en/projects/vegetation-parameters/
creator_email	remotesensing@vito.be
project	Climate Change Initiative - European Space Agency
geospatial_lat_min	Minimum latitude of the tile or site (center of the lower left pixel)
geospatial_lat_max	Maximum latitude of the tile or site (center of the upper right pixel)
geospatial_lon_min	Minimum longitude of the tile or site (center of the lower left pixel)
geospatial_lon_max	Maximum longitude of the tile or site (center of the upper right pixel)
geospatial_vertical_min	NA
geospatial_vertical_max	NA
time_coverage_start	Startdate of the output product
time_coverage_end	Enddate of the output product
time_coverage_duration	Length of the time series in the file
time_coverage_resolution	Temporal resolution of the output product
standard_name_vocabulary	NetCDF Climate and Forecast (CF) Metadata Convention version 1.8
license	ESA CCI Data Policy: free and open access
platform	List of platforms from which sensor data is used in the retrieval
sensor	List of sensors included in the retrieval
spatial_resolution	1 km
key_variables	LAI, fAPAR
geospatial_lat_units	Degree
geospatial_lon_units	Degree
geospatial_lon_resolution	0.008928572
geospatial_lat_resolution	-0.008928572
processor_version	OptiSAIL-r37088M
mask_clouds_from_processing	On
processing level	L3S
prior_names	Names of the prior parameters
prior_median	Median of the prior parameters
prior_minimum	Minimum of the prior parameters
prior_maximum	Maximum of the prior parameters
prior_note	
wavelenghts_for_diagnostics_nm	Full set of wavelengths available for retrieval (400 – 2500 nm)
soil_mean_BHR_for_diagnostics	Full set of mean BHR available for retrieval (0.0695912 – 0.344225
soilEOF1_BHR_for_diagnostics	Full set of BHR of empirical soil spectrum variation 1 available for retrieval (0.0169885 – 0.0620258)
soilEOF2_BHR_for_diagnostics	Full set of BHR of empirical soil spectrum variation 2 available for retrieval (0.0226437 – -0.0480643)
wavelenghts_for_inversion_nm	Wavelength used for inversion
soil_mean_BHR_for_inversion	Soil mean BHR used for inversion
soilEOF1_BHR_for_inversion	BHR of empirical soil spectrum variation 1 used for inversion
soilEOF2_BHR_for_inversion	BHR of empirical soil spectrum variation 2 used for inversion
doi	Digital Object Identifier of the dataset

Annex B contains an example of these global attributes.

3.3.2 Variables

Table 4 gives the digital numbers (DN) associated with the physical parameters ranges and the no data values for each of the product layers (see section 3.1).

The physical values are retrieved by:

$$PhyVal = DN \cdot scale_{factor} + add\_offset \qquad Eq.\ 1$$

Where the scale_factor and add_offset are given in Table 4. This information is stored in the variable attributes for each variable.

Table 4: Range of values and scaling factors of the parameters.

	Units	Minimum value	Maximum value	Missing value	Scale_factor	Add_offset
LAI	$m^2.m^{-2}$	0	8	-32768	0.000122074	4
fAPAR	-	0	1	-32768	1.525925e-05	0.5
LAI_ERR	$m^2.m^{-2}$	0		-32768	0.0002441481	8
fAPAR_ERR	-	0		-32768	3.051851e-05	1
fAPAR_Cab	-	0	1			
Cab	$ug.cm^{-2}$	0	100	-32768	0.001525925	50
BHR_VIS	-	0	1	-32768	1.525925e-05	0.5
BHR_NIR	-	0	1	-32768	1.525925e-05	0.5
BHR_SW	-	0	1	-32768	1.525925e-05	0.5
DHR_VIS	-	0	1	-32768	4.793836e-05	1.570796
DHR_NIR	-	0	1	-32768	4.793836e-05	1.570796
DHR_SW	-	0	1	-32768	4.793836e-05	1.570796
fAPAR_Cab_ERR	-	0				
Cab_ERR	$ug.cm^{-2}$	0		-32768	0.003051851	100
BHR_VIS_ERR	-	0		-32768	3.051851e-05	1
BHR_NIR_ERR	-	0		-32768	3.051851e-05	1
BHR_SW_ERR	-	0		-32768	3.051851e-05	1
DHR_VIS_ERR	-	0		-32768	9.587673e-05	3.141593
DHR_NIR_ERR	-	0		-32768	9.587673e-05	3.141593
DHR_SW_ERR	-	0		-32768	9.587673e-05	3.141593
Param1_param2_correl	-	-1	1	-128	0.007874016	0
P_chisquare	-	0	1	-32768	1.525925e-05	0.5

This information is stored in the variable attributes for each variable.
The choice of scale-factor and add_offset of the DHR layers may change in the future, as it is not optimal for the physical range [0, 1].
Software using this data should rely on the values given in the variable attributes of the netCDF file rather than hard-code the values from this document.

3.3.3 Variable attributes

The attributes for each variable in the NetCDF file follow the CCI Data Standard v2.3 and the CF recommendations. The attributes are listed in Table 5.

Table 5: Variable attributes

Attribute Name	Attribute Meaning
add_offset	Offset to be added after the DN value is multiplied by the scale_factor (see Eq. 1)
scale_factor	Factor to multiply with the DN value (see Eq. 1)
ancillary_variables	Variables that are related to the variable for correct interpretation (e.g. uncertainties and flags)
ancillary_roles	The role of the ancillary_variables
units	Units of the variable
long_name	Name of the variable
valid_min	Theoretical minimum values expressed in DN
Valid_max	Theoretical maximum value expressed in DN
Missing_value	-32768
prior	Prior value
Grid_mapping	Crs

3.4 Quality information

3.4.1 N_bands_used

N_bands_used provides the number of observations that contributed to the retrieval. For this purpose, observations are counted per band, that is, for example a single overpass of VGT produces four "observations".

Currently a cut-off of three observations per band and sensor is used to limit the influence of potential error correlations of data retrieved with the same sensor and platform or using the same ancillary data in the atmospheric correction, and to improve computational speed. For a sensor with four bands, for example, “n_bands_used” has a maximum value of 12 (=3*4).

3.4.2 Invcode

The layer invcode represents the inversion code of the retrieval algorithm and contains various diagnostics. Further details are given in Table 6.

Table 6: Values and meaning of invcode. Bits 3,7,10-31 are currently not used.

Bit	Value	Flag	Meaning
0	1	NOT_PROCESSED	Pixel not processed (sea point or missing data)
1	2	OPTIERR_TOO_MANY_ITER	Inversion stopped at iteration limit
2	4	OPTIERR_LNSRCH	Inversion stopped for numerical reasons
4	16	XHESSERR_NOTSYM	The computed Hessian matrix is not symmetric, and uncertainties and correlations cannot be computed.
5	32	XHESSERR_INVERSION	The computed Hessian matrix cannot be inverted, and uncertainties and correlations cannot be computed.

6	64	XHESSERR_NOTPOSDEF	The computed Hessian matrix is not positive definite (e.g. if no cost function minimum was reached), and uncertainties and correlations cannot be computed.
8	256	RETR_UNTRUSTED	The retrieval is not trusted, because any of the previous bits with "ERR" in their name are raised, or the chi-square-criterion is violated.
9	512	RETR_LOW_QUALITY	The retrieval matches one or more criteria defined for low quality (see text for explanation),

The fill value of invcode is 2147483647. However, "NOT_PROCESSED" is used for missing pixels.

It is recommended to use the RETR_UNTRUSTED flag. The flag RETR_LOW_QUALITY filters out many of the outliers in the dataset, but also removes good retrievals (see section 3.6 in VP-CCI_D4.1_PVIR for detailed analysis).

3.4.3 p_chisquare

"**p_chisquare**" gives the probability of a χ^2-distribution with the same number of degrees of freedom as the retrieval, to have a cost function value greater or equal than the one reached in the inversion of the pixel ($p_{\chi^2}\left(J_{min,n}\right) = p\left(x \geq J_{min,n} \middle| X \sim \chi_n^2\right)$). Low values of "p_chisquare" are an indicator that the model and data are inconsistent, and hence the retrieval quality is low. In CRDP-1, retrievals with p_chisquare < 0.001 are discarded (invcode is set to "RETR_UNTRUSTED" and data to the fill value). Retrievals with 0.001<p_chisquare<0.01 are marked as "RETR_UNTRUSTED" in "invcode".

It is recommended to use a higher threshold on the p_chisquare to remove outliers in the dataset. Section 3.6 in VP-CCI_D4.1_PVIR provides a detailed analysis. The higher the threshold the more outliers are removed, but at the expense of also removing some good values. In general, we recommend a threshold of at least 0.1.

3.5 Product characteristics

3.5.1 Projection and grid information

The product is generated in a regular latitude/longitude grid (plate carrée projection) with the ellipsoïd WGS 1984 (Terrestrial radius=6378km). The resolution of the grid is 1/112°, which is about 1 km at the equator.
The reference is the centre of the pixel. It means that the longitude of the upper left corner of the pixel is (pixel_longitude – angular_resolution/2.). The products are provided in 10° x 10° tiles and per sites.

3.5.2 Spatial information

CRDP-1 is delivered for a N-S transect in tiles. Figure 5 shows the definition of the tiling system which is adopted from PROBA-V (Wolters et al., 2023). The red outlined area indicates the tiles that are delivered for CRDP-1. Each file contains the output of 1 tile and 1 date.
Additionally, a set of 932 sites is processed to enable global validation. These sites are selected from networks such as Landval 1.1 (Fuster et al., 2020; Sánchez-Zapero et al., 2020), Calibration sites (Lacherade et al., 2013), GBOV (Brown et al., 2021), DIRECT 2.1 (Camacho et al., 2013) and AMMA (Redelsperger et al., 2006). The site files include a 3x3 pixels window around the site coordinate for an entire year. Each site is delivered as a separate file per year.

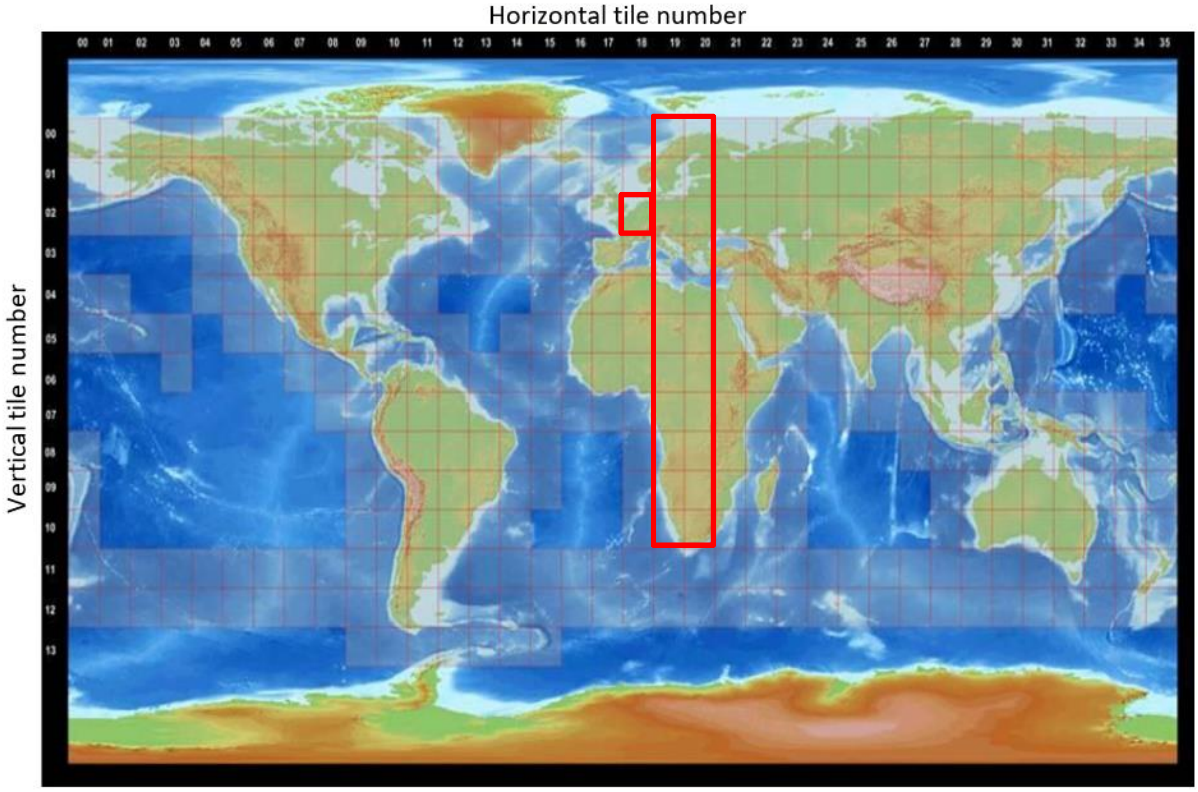

Figure 5: Tiling reference (from Wolters et al., 2023). The red outlined area indicated the tiles that are delivered for CRDP-1.

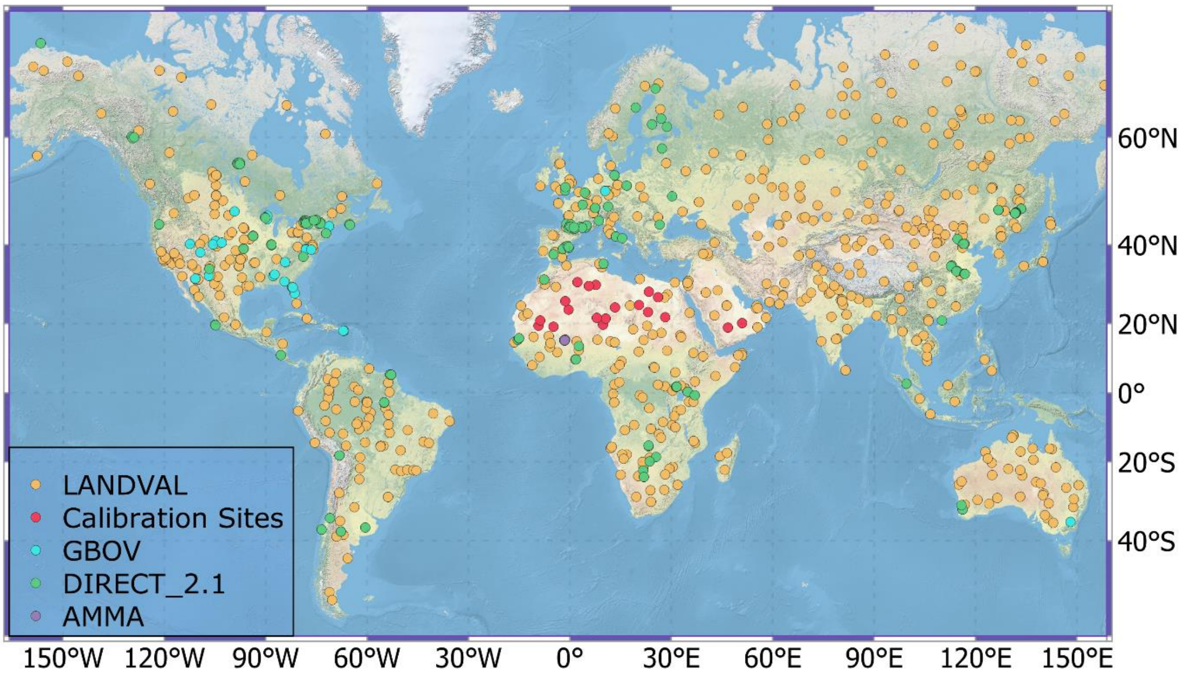

Figure 6: Selection of the sites for which 3x3 km LAI and fAPAR retrievals are available. The sites correspond to a combination of Landval 1.1 (Fuster et al., 2020; Sánchez-Zapero et al., 2020), Calibration sites (Lacherade et al., 2013), GBOV (Brown et al., 2021), DIRECT 2.1 (Camacho et al., 2013) and AMMA (Redelsperger et al., 2006).

3.5.3 Temporal information

The CRDP-1 dataset spans the period 2000 – June 2020. Both tile and site data have a temporal resolution of 5 days. For the sites data, all 5-day outputs are organised in a single file. For the tiles, there is a separate file every 5 days.
Input data of 10 days is used for the input data selection prior to the retrieval. This window is shifted with 5 days for the next retrieval.

4 Summary of Quality Assessment

4.1 Method

The quality assessment of VP_CCI LAI and fAPAR products obtained using OPTISAIL (see section 2.3is conducted over a climate data record (2000-2020) dataset retrieved from SPOT/VGT and PROBA-V input data (CDRP-1). The dataset was generated over a latitudinal North-South transect and over a selection of sites for both product intercomparison (LANDVAL) and direct validation (DIRECT V2.1, GBOV, AMMA) purposes (see section 3.5.2). The methodology is described in the product validation plan (VP-CCI_D3.1_PVP), in agreement with the CEOS LPV best practices for validation of LAI products. Two main validation approaches are defined: direct validation (i.e., comparison of satellite products with in situ measurements) and indirect validation or product intercomparison. Several criteria of performance are evaluated, including completeness, spatial consistency, temporal consistency, error evaluation (Accuracy, Precision and Uncertainty) and conformity test with regard to CGOS uncertainty requirements.

4.2 Reference data sets

4.2.1 Reference satellite products

Different satellite products from different services (CGLS, NASA) are used for product intercomparison with VP_CCI fAPAR and LAI products. It should be noted that reference satellite products provide actual LAI products whereas VP_CCI provides effective LAI retrievals. Table 7 summarizes the main characteristics of existing LAI and fAPAR products.

Table 7: Characteristics of the existing LAI/FAPAR global remote sensing reference products. ANN and RTM stands for "Artificial Neural Network", and "Radiative Transfer Model", respectively. GSD stands for "Ground Sampling Distance"

Product	Satellite /Sensor	GSD	Frequency /compositing	Temporal availability	Algorithm	Clumping	Reference
CGLS Collection 1km V2	SPOT/VGT PROBA/VGT	1 km	10 days /variable	1999-2014 2014-2020	ANN trained with CYC and MOD + gap filling & smoothing	Weighted of CYC and MOD	(Verger et al., 2023) [**Error! Reference source not found.**]
NASA MOD15A2H C6.1	TERRA /MODIS	500 m	8 days /8 days	2000-present	Inversion RTM 3D	Plant, canopy & landscape	(Knyazikhin et al., 1998) [**Error! Reference source not found.**]

NASA VNP15A2H C1	SNPP /VIIRS	500 m	8 days /8 days	2012-present	Inversion RTM 3D	Plant, canopy & landscape	(Knyazikhin et al., 1998) [**Error! Reference source not found.**]

4.2.2 Ground reference data sets

Ground reference data were used from the following data sets:

- CEOS WGCV LPV DIRECT V2.1 data
- Ground-Based Observations for Validation (GBOV)
- AMMA – Cycle Atmosphérique et Cycle Hydrologique (CATCH)

Detailed information on these data sets can be found in section 2.3 of the VP-CCI_D4.1_PVIR.

4.3 Results

The summary of the validation results is provided in Table 8. The full analysis and results are detailed in the VP-CCI_D4.1_PVIR. Main conclusions for each quality criteria are:

Product completeness

- VP_CCI LAI and fAPAR show the expected spatial trend of missing data, which is mainly located over northern regions (wintertime) and the equatorial belt.
- Over areas typically affected by cloud/snow (northern regions in winter) and persistent cloud coverage (equatorial), VP_CCI LAI and fAPAR shows better completeness than CGLS V2 non-filled and VNP15A2H C1, which could be indicative of less restrictive cloud/snow screening approach.

Spatial consistency

- VP_CCI LAI and fAPAR shows, generally, reliable spatial distributions. However, the spatial consistency needs to be improved as several inconsistencies are found:
  - Unrealistic high values over northern regions (Europe), showing abrupt changes (i.e., outliers) between consecutive dates for both local scale and larger areas.
  - Unrealistically low values for LAI over equatorial areas with noisy transitions between consecutive dates.
  - Stripes displaying different values over northern latitudes in winter and equatorial areas.
- VP_CCI and CGLS V2 are spatially consistent over large areas with most of residuals between ±0.5 LAI and ±0.1 fAPAR. Larger spatial inconsistencies are however observed over equatorial areas and Europe.

Temporal consistency

- VP_CCI temporal variations display good consistency with reference products over most of the 720 LANDVAL sites, as well as they are consistent with ground data showing similar temporal trajectories.
- The main limitations from the qualitative inspection of VP_CCI temporal trajectories are:
  - Noisy temporal variations mainly over EBF, probably due to cloud contamination.
  - Some outliers are found typically during wintertime.

- VP_CCI displays remarkably good temporal continuity when different data sources are used (SPOT/VGT, PROBA-V), improving that of other products (e.g., CGLS V2) over sparse vegetated and desert targets.

Error evaluation (Direct validation)

- Comparison with DIRECT V2.1:
    - For effective LAI, VP_CCI shows systematic lower values (mainly for forest higher values) (B=-0.6) and RMSD of 1.2. Around 16% and 26% of OPTISAIL cases are within goal and threshold GCOS uncertainty requirements.
    - Satellite CGLS V2 and MOD15A2H C6.1 references show slightly better accuracy and only slightly higher number of cases within goal (~17-19%) and threshold (~28-30%) GCOS uncertainty requirements.
    - For fAPAR, VP_CCI shows systematic positive bias (0.07), linear relationship (slope~ 1) and RMSD of 0.15. Satellite references show better overall agreement for fAPAR.
    - VP_CCI provides lower number of samples within optimal (12%) and threshold (22%) GCOS uncertainty requirements than CGLS V2 (23% and 33%) and MOD15A2H C6.1 (22% and 30%).

- Comparison with GBOV V3:
    - VP_CCI shows large negative bias compared with GBOV V3 LAI for forest sites, as expected (LAIeff VP_CCI vs LAI true GBOV).
    - For non-forest sites VP_CCI shows better agreement with GBOV V3 LAI (B=0.1, RMSD= 0.29) than CGLS V2 and VNP15A2H C1. For non-forest sites, VP_CCI shows the higher number of samples within GCOS optimal (25%) and threshold (47%) uncertainty requirements.
    - For fAPAR, VP_CCI (B=0.02, RMSD=0.14) tends to provide higher values than GBOV V3 for non-forest sites and the opposite trend for forest cases. Both satellite references provide lower uncertainties around 0.1.
    - VP_CCI provides slightly lower cases within goal (18%) and threshold (33%) GCOS uncertainty requirements than reference products.
- Comparison with AMMA:
    - VP_CCI shows slight positive bias (0.05) and RMSD of 0.31 compared with AMMA LAIeff, with 18% and 38% of cases are within optimal and threshold GCOS levels. Reference satellite CGLS V2 and MOD15A2H C6.1 products show similar overall uncertainty in relative terms compared with LAI (RMSD~75%).
    - For fAPAR, VP_CCI shows a tendency to provide higher values than AMMA ground measurements (B=0.06, slope=1.3), with overall uncertainty (RMSD) of 0.15. CGLS V2 shows the best agreement (B~0, RMSD=0.12) and MOD15A2H C6.1 shows similar performance than OPTISAIL.

Error evaluation (product intercomparison)

- VP_CCI shows, as expected, large differences (lower values) with CGLS V2, MOD15A2H C6.1 and VNP15A2H C1 due to the different LAI definitions (LAIeff vs true LAI). Slopes of MAR are typically around 0.5 compared with references. The comparison of VP_CCI fAPAR with reference satellite products shows:
    - VP_CCI vs CGLS V2 shows the better agreement (B=-4%, RMSD = 0.09). VP_CCI typically tends to provide slightly lower values than CGLS V2 for low values and high (EBF) values.

  - Worse agreement is found in the comparison of VP_CCI vs NASA MOD15A2H C6.1 and VNP15A2H C1 products (RMSD=0.13). The NASA product is higher than VP_CCI for low fAPAR values, expected due to known NASA products limitations.
  - Per biome type, larger discrepancies are found between VP_CCI and reference products for EBF and NLF.
- VP_CCI provides, in overall, better intra-annual precision than VNP15A2H C1 (i.e., high stability at short time scale) and worse than CGLS V2 (expected as it is a smoothed product).

The inter-annual precision of VP_CCI (4.7% for LAI and 6.1% for fAPAR) is similar to that found for CGLS V2 and slightly better than VNP15A2H C1.

Table 8: Summary of VP_CCI LAI and fAPAR validation results

Criteria	performance	Comments
Product completeness	+	- Gaps located in wintertime (northern) and equatorial areas. Better than reference products over these areas (probably cloud/snow contamination). VP_CCI quality flag is little restrictive.
Spatial consistency	±	- Relivable distributions and good spatial consistency with CGLS V2 over most areas. - Some stripe artefacts and spatial inconsistencies mainly over EBF and some areas over Europe.
Temporal consistency	±	- VP_CCI shows similar temporal trends than reference satellite products (CGLS V2, MOD15A2H C6.1, VNP15A2H C1) and ground observations (DIRECT V2.1, GBOV V3 and AMMA). - VP_CCI provides some outliers not identified by quality flags and noisy temporal trends over EBF.
Error evaluation: Direct validation vs DIRECT V2.1	±	LAI: - B=-0.6, RMSD=1.2, goal/threshold=16%/26%. VP_CCI <DIRECT V2.1 mainly for high values (forests). - References show improved results: CGLS V2 (19%/30% within optimal/target) and MOD15A2H C6.1 (17%/28%) fAPAR : - B=0.07, RMSD=0.15, goal/threshold=12%/22%. Linear relation (slope ~ 1). - References show improved results: CGLS V2 (23%/33% within optimal/target) and MOD15A2H C6.1 (22%/ 30%).
Error evaluation: Direct validation vs GBOV V3	±	LAI (forest): - VP_CCI (LAIeff) < GBO V3 (true LAI). LAI (non-forest): - B=0.01, RMSD=0.29, goal/threshold=25%/48%. - References show worse results: CGLS V2 (5%/10% within optimal/target) and VNP15A2H C1 (12%/ 22%). fAPAR: - B=0.02, RMSD=0.14, goal/threshold=18%/33%. VP_CCI > GBOV V3 for non-forest sites and < for forest cases. - References show better results: CGLS V2 (23%/38% within optimal/target) and VNP15A2H C1 (19%/ 38%).
Error evaluation: Direct validation vs AMMA	±	LAI: - B=0.05, RMSD=0.31, goal/threshold=18%/38%. - References show worse compliance: CGLS V2 (17%/30% within optimal/target) and MOD15A2H C6.1 (11%/30%). fAPAR: - B=0.06, RMSD=0.15, goal/threshold=7%/12%.

		- References show better results: CGLS V2 (8%/17% within optimal/target) and MOD15A2H C6.1 (10%/ 21%).
Error evaluation: Product intercomparison	±	LAI: - Large differences in both cases (LAIeff vs true LAIeff). fAPAR : - Vs. CGLS V2: B=-0.01, RMSD=0.09, goal/threshold=16%/30% - VS. NASA: B=-0.3, RMSD=0.13, % goal/threshold=12%/23% Analysis per biome: large differences for EBF and NLF.
Intra-annual precision	±	- VP_CCI better than VNP15A2H C1 and worse than CGLS V2 (smoothed)
Inter-annual precision	+	- VP_CCI (4.7% for LAI and 6.1% for fAPAR) is similar to that found for CGLS V2 and slightly better than VNP15A2H C1.

4.4 Summary and concluding remarks

This validation exercise, performed over a limited dataset (global sampling of sites and latitudinal transect), demonstrated overall good quality of VP_CCI LAI and fAPAR product. The product completeness was better than other existing reference products, but as a consequence of ingesting probably snow/cloud contamination in the retrieval. A good spatial consistency is found in overall, however there are some spatial inconsistencies such as stripes or unrealistic high values that need to be improved at local scale. VP_CCI LAI and fAPAR temporal variations are consistent with reference products and ground observations. The direct validation using DIRECT V2.1, GBOV V3 and AMMA showed good correlations with only slightly worse accuracy and l uncertainty than other satellite references, except in the comparison with GBOV V3 for non-forest cases where VP_CCI shows the best agreement. The comparison with satellite references shows, as expected, lower values for LAI (VP_CCI provides LAIeff whilst references true LAI) and good agreement for FAPAR (RMSD=0.09 compared with CGLS V2 and RMSD=0.12 compared with MOD15A2H C6.1 and VNP15A2H C1). VP_CCI provides, in overall, better smoothness than VNP15A2H C1 (i.e., higher precision at short time scale) and worse than CGLS V2 (as expected as it is a smoothed product). The inter-annual precision of VP_CCI is similar to that found for CGLS V2 and slightly better than VNP15A2H C1.

4.5 Limitations

The main limitations of the VP_CCI products are:

- Stripes artifacts and some spatial inconsistencies over northern regions (Europe, with abrupt changes showing unexpected high values) and equatorial areas (lower values), probably due to cloud/snow contamination.
- Noisy profiles (mainly for EBF) and some outliers for other biomes are found. The solution to remove these outliers should be further investigated (e.g., other flags or ***p_chisquare*** layer could be useful by applying more restrictive screening).

It should be noted that p_chisquare or RETR_LOW_QUALTY layers could be partly useful to identify (and filter) most of these outliers as a consequence of more restrictive screening (i.e., worse completeness). In case of χ^2, when the threshold turns more restrictive (i.e., greater χ^2), the outlier identification is better, but more valid data is also removed. RETR_LOW_QUALITY is also useful to identify most of the outliers, but the product completeness is considerably worse removing a large number of valid retrievals. Consequently, based on our analysis, it is recommended to use χ^2 to filter outliers.

5 Software Tools

The VP_cci data are delivered in NetCDF format, which can be visualized and manipulated in a wide choice of software packages. A list of these software packages is provided on the Unidata website (https://www.unidata.ucar.edu/software/netcdf/software.html).

6 Data Policy

All users from the ESA CCI program benefit from the free and open access as defined in the CCI Data Policy v1.1 which makes the ECV datasets freely available without any restrictions on use once released onto the CCI Open Data Portal.

See https://climate.esa.int/en/explore/access-climate-data/ for the latest information on the ESA CCI data policy.

7 Data Access

The Open Data Portal hosts the suite of Essential Climate Variable datasets produced under the Climate Change Initiative (CCI) programme as a single point of access.

The DOI of the dataset is http://10.5285/34e4bfe402c048c783e64eac0f0bca37 .

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Annex A: List of sites

ID	Name	Latitude	Longitude	Network
1	ABRACOS_HILL	-10.76	-62.3583	LANDVAL V1.1
2	ADAMOWKA	51.75	59.75	LANDVAL V1.1
3	AGUASCALIENTES	21.7	-102.32	LANDVAL V1.1
4	AIRE_ADOUR	43.7	0.25	LANDVAL V1.1
5	AL_KHAZNAH	24.1586	55.1006	LANDVAL V1.1
6	AMES	42.0214	-93.7748	LANDVAL V1.1
7	AOE_BAOTOU	40.8517	109.629	LANDVAL V1.1
8	ARM_CART_PONCA	36.77	-97.13	LANDVAL V1.1
9	ARM_CART_SGP	36.64	-97.5	LANDVAL V1.1
10	ARM_CART_SHIDLER	36.93	-96.86	LANDVAL V1.1
11	ASP	-23.798	133.888	LANDVAL V1.1
12	AU-FOG	-12.5425	131.307	LANDVAL V1.1
13	AU-HOW	-12.4943	131.152	LANDVAL V1.1
14	AU-TUM	-35.6557	148.152	LANDVAL V1.1
15	AUTILLA	41.9972	-4.60306	LANDVAL V1.1
16	AZ_BORDER_STATION	32.487	-114.7	LANDVAL V1.1
17	BAC_LIEU	9.28	105.73	LANDVAL V1.1
18	BAMBEY-ISRA	14.7086	-16.4767	LANDVAL V1.1
19	BANIZOUMBOU	13.5412	2.66475	LANDVAL V1.1
20	BARTON_BENDISH	52.61	0.53	LANDVAL V1.1
21	BASKIN	32.2822	-91.7387	LANDVAL V1.1
22	BE-LON	50.5522	4.74494	LANDVAL V1.1
23	BELMANIP_00001	-43.9024	-65.7651	LANDVAL V1.1
24	BELMANIP_00003	-35.4368	-68.0011	LANDVAL V1.1
25	BELMANIP_00004	-38.6913	-67.0271	LANDVAL V1.1
26	BELMANIP_00006	-39.0882	-69.0583	LANDVAL V1.1
27	BELMANIP_00007	-32.0335	-63.7794	LANDVAL V1.1
28	BELMANIP_00009	-21.8158	-62.0896	LANDVAL V1.1
29	BELMANIP_00010	-24.7802	-62.3381	LANDVAL V1.1
30	BELMANIP_00013	-22.1715	-51.6665	LANDVAL V1.1
31	BELMANIP_00014	-22.5947	-49.9576	LANDVAL V1.1
32	BELMANIP_00017	-11.7422	-71.1148	LANDVAL V1.1
33	BELMANIP_00019	-11.7465	-53.3447	LANDVAL V1.1
34	BELMANIP_00020	-18.7696	-62.0803	LANDVAL V1.1
35	BELMANIP_00024	-14.3384	-43.3384	LANDVAL V1.1
36	BELMANIP_00025	-14.7254	-41.7471	LANDVAL V1.1
37	BELMANIP_00026	-16.8169	-50.0985	LANDVAL V1.1
38	BELMANIP_00028	-0.264328	-71.2695	LANDVAL V1.1
39	BELMANIP_00029	-1.60556	-71.5518	LANDVAL V1.1
40	BELMANIP_00030	-2.67854	-63.648	LANDVAL V1.1
41	BELMANIP_00031	-4.47325	-54.648	LANDVAL V1.1
42	BELMANIP_00032	-4.92849	-69.1288	LANDVAL V1.1
43	BELMANIP_00033	-5.88134	-58.9878	LANDVAL V1.1

44	BELMANIP_00034	-6.51177	-53.7028	LANDVAL V1.1
45	BELMANIP_00035	-7.60093	-59.4101	LANDVAL V1.1
46	BELMANIP_00036	-8.3481	-72.2965	LANDVAL V1.1
47	BELMANIP_00038	-9.74506	-60.3351	LANDVAL V1.1
48	BELMANIP_00040	-8.40302	-35.6065	LANDVAL V1.1
49	BELMANIP_00042	7.06998	-59.4139	LANDVAL V1.1
50	BELMANIP_00044	2.9457	-53.7684	LANDVAL V1.1
51	BELMANIP_00045	1.77212	-63.7892	LANDVAL V1.1
52	BELMANIP_00046	0.720435	-71.3605	LANDVAL V1.1
53	BELMANIP_00047	5.73429	-69.186	LANDVAL V1.1
54	BELMANIP_00048	3.99634	-71.6848	LANDVAL V1.1
55	BELMANIP_00050	17.594	-89.7827	LANDVAL V1.1
56	BELMANIP_00051	14.3184	-84.9776	LANDVAL V1.1
57	BELMANIP_00056	29.9996	-104.19	LANDVAL V1.1
58	BELMANIP_00057	27.5711	-103.608	LANDVAL V1.1
59	BELMANIP_00058	28.891	-98.1605	LANDVAL V1.1
60	BELMANIP_00060	39.5413	-80.5677	LANDVAL V1.1
61	BELMANIP_00061	35.7971	-93.4936	LANDVAL V1.1
62	BELMANIP_00063	34.2604	-110.508	LANDVAL V1.1
63	BELMANIP_00068	30.6321	-105.284	LANDVAL V1.1
64	BELMANIP_00069	38.6332	-98.9132	LANDVAL V1.1
65	BELMANIP_00070	32.1832	-97.0654	LANDVAL V1.1
66	BELMANIP_00071	39.8906	-88.2923	LANDVAL V1.1
67	BELMANIP_00072	36.7011	-86.7947	LANDVAL V1.1
68	BELMANIP_00075	41.5882	-77.8524	LANDVAL V1.1
69	BELMANIP_00081	47.7168	-67.7938	LANDVAL V1.1
70	BELMANIP_00082	46.7454	-70.4039	LANDVAL V1.1
71	BELMANIP_00083	46.5925	-105.115	LANDVAL V1.1
72	BELMANIP_00085	41.2419	-108.279	LANDVAL V1.1
73	BELMANIP_00086	46.3371	-101.066	LANDVAL V1.1
74	BELMANIP_00087	42.1273	-100.904	LANDVAL V1.1
75	BELMANIP_00088	49.2711	-102.671	LANDVAL V1.1
76	BELMANIP_00089	43.5445	-96.3368	LANDVAL V1.1
77	BELMANIP_00090	42.7326	-82.2058	LANDVAL V1.1
78	BELMANIP_00091	41.2516	-94.7811	LANDVAL V1.1
79	BELMANIP_00094	52.3826	-124.286	LANDVAL V1.1
80	BELMANIP_00095	52.7953	-96.2	LANDVAL V1.1
81	BELMANIP_00098	50.2656	-85.7807	LANDVAL V1.1
82	BELMANIP_00099	57.6586	-118.521	LANDVAL V1.1
83	BELMANIP_00100	57.2807	-93.9929	LANDVAL V1.1
84	BELMANIP_00103	57.1596	-157.684	LANDVAL V1.1
85	BELMANIP_00106	52.1102	-104.751	LANDVAL V1.1
86	BELMANIP_00108	61.0029	-127.621	LANDVAL V1.1
87	BELMANIP_00113	68.9221	-158.789	LANDVAL V1.1
88	BELMANIP_00114	67.9168	-145.462	LANDVAL V1.1
89	BELMANIP_00116	68.4902	-121.442	LANDVAL V1.1

90	BELMANIP_00117	64.4099	-83.8562	LANDVAL V1.1
91	BELMANIP_00118	60.502	-72.3714	LANDVAL V1.1
92	BELMANIP_00120	-21.4205	30.4448	LANDVAL V1.1
93	BELMANIP_00122	-21.9043	29.4701	LANDVAL V1.1
94	BELMANIP_00123	-27.7076	23.828	LANDVAL V1.1
95	BELMANIP_00124	-23.9527	20.2106	LANDVAL V1.1
96	BELMANIP_00125	-22.1923	45.8077	LANDVAL V1.1
97	BELMANIP_00126	-29.4015	19.646	LANDVAL V1.1
98	BELMANIP_00127	-27.6076	27.9534	LANDVAL V1.1
99	BELMANIP_00128	-23.4833	28.1953	LANDVAL V1.1
100	BELMANIP_00134	-17.9764	16.8231	LANDVAL V1.1
101	BELMANIP_00135	-18.8817	23.598	LANDVAL V1.1
102	BELMANIP_00136	-18.4626	44.4068	LANDVAL V1.1
103	BELMANIP_00138	-17.5573	46.5038	LANDVAL V1.1
104	BELMANIP_00139	-17.9563	15.5042	LANDVAL V1.1
105	BELMANIP_00140	-0.36492	12.7904	LANDVAL V1.1
106	BELMANIP_00141	-2.86296	13.113	LANDVAL V1.1
107	BELMANIP_00142	-4.58979	23.4367	LANDVAL V1.1
108	BELMANIP_00144	-9.51881	19.0008	LANDVAL V1.1
109	BELMANIP_00146	-5.44478	31.7372	LANDVAL V1.1
110	BELMANIP_00147	-9.56911	30.2923	LANDVAL V1.1
111	BELMANIP_00148	-6.90342	30.8569	LANDVAL V1.1
112	BELMANIP_00151	-2.67383	35.1915	LANDVAL V1.1
113	BELMANIP_00152	-5.07599	32.8733	LANDVAL V1.1
114	BELMANIP_00154	2.4092	13.1937	LANDVAL V1.1
115	BELMANIP_00155	1.8562	28.1937	LANDVAL V1.1
116	BELMANIP_00158	7.10351	13.4356	LANDVAL V1.1
117	BELMANIP_00165	5.98023	31.1795	LANDVAL V1.1
118	BELMANIP_00169	3.29777	36.9866	LANDVAL V1.1
119	BELMANIP_00171	1.25239	34.0831	LANDVAL V1.1
120	BELMANIP_00172	8.09267	-11.1531	LANDVAL V1.1
121	BELMANIP_00173	2.10743	32.8733	LANDVAL V1.1
122	BELMANIP_00175	10.498	-8.98624	LANDVAL V1.1
123	BELMANIP_00177	16.2652	-10.7606	LANDVAL V1.1
124	BELMANIP_00179	12.3254	28.7599	LANDVAL V1.1
125	BELMANIP_00180	16.4832	-6.244	LANDVAL V1.1
126	BELMANIP_00181	14.6893	13.113	LANDVAL V1.1
127	BELMANIP_00186	10.6991	39.4063	LANDVAL V1.1
128	BELMANIP_00189	12.0236	20.3719	LANDVAL V1.1
129	BELMANIP_00195	17.3885	27.0662	LANDVAL V1.1
130	BELMANIP_00201	29.8195	-4.14699	LANDVAL V1.1
131	BELMANIP_00203	22.1242	-13.7448	LANDVAL V1.1
132	BELMANIP_00207	27.87	28.8718	LANDVAL V1.1
133	BELMANIP_00214	21.6045	58.0374	LANDVAL V1.1
134	BELMANIP_00222	22.2416	42.7937	LANDVAL V1.1
135	BELMANIP_00224	25.8796	59.0859	LANDVAL V1.1

136	BELMANIP_00225	35.0917	-1.00148	LANDVAL V1.1
137	BELMANIP_00226	37.4891	40.9387	LANDVAL V1.1
138	BELMANIP_00228	30.4309	-7.37316	LANDVAL V1.1
139	BELMANIP_00229	34.7228	9.48356	LANDVAL V1.1
140	BELMANIP_00230	31.8057	20.6945	LANDVAL V1.1
141	BELMANIP_00233	30.9501	31.0539	LANDVAL V1.1
142	BELMANIP_00234	38.0088	40.858	LANDVAL V1.1
143	BELMANIP_00241	39.5513	58.8439	LANDVAL V1.1
144	BELMANIP_00243	44.5329	38.8881	LANDVAL V1.1
145	BELMANIP_00244	43.8603	-1.09889	LANDVAL V1.1
146	BELMANIP_00246	48.3274	49.5687	LANDVAL V1.1
147	BELMANIP_00247	49.6854	54.4886	LANDVAL V1.1
148	BELMANIP_00248	42.1242	-5.11484	LANDVAL V1.1
149	BELMANIP_00250	44.8702	11.9698	LANDVAL V1.1
150	BELMANIP_00251	46.1107	19.9447	LANDVAL V1.1
151	BELMANIP_00253	47.0995	33.3209	LANDVAL V1.1
152	BELMANIP_00255	47.8244	53.0368	LANDVAL V1.1
153	BELMANIP_00256	41.9733	55.5371	LANDVAL V1.1
154	BELMANIP_00257	57.6045	42.5802	LANDVAL V1.1
155	BELMANIP_00258	54.7396	57.3921	LANDVAL V1.1
156	BELMANIP_00260	59.6518	58.6826	LANDVAL V1.1
157	BELMANIP_00262	57.2544	50.6172	LANDVAL V1.1
158	BELMANIP_00264	51.923	-4.31301	LANDVAL V1.1
159	BELMANIP_00265	53.1804	-0.114285	LANDVAL V1.1
160	BELMANIP_00266	50.8836	2.57211	LANDVAL V1.1
161	BELMANIP_00267	51.068	11.4999	LANDVAL V1.1
162	BELMANIP_00270	53.281	53.2788	LANDVAL V1.1
163	BELMANIP_00271	63.1771	44.0396	LANDVAL V1.1
164	BELMANIP_00272	64.1696	51.1818	LANDVAL V1.1
165	BELMANIP_00273	61.8885	58.3599	LANDVAL V1.1
166	BELMANIP_00274	63.8846	26.7436	LANDVAL V1.1
167	BELMANIP_00276	-31.1529	124.073	LANDVAL V1.1
168	BELMANIP_00277	-34.8077	141.312	LANDVAL V1.1
169	BELMANIP_00280	-31.3838	116.869	LANDVAL V1.1
170	BELMANIP_00281	-35.864	143.026	LANDVAL V1.1
171	BELMANIP_00284	-26.2009	115.082	LANDVAL V1.1
172	BELMANIP_00285	-23.6509	124.98	LANDVAL V1.1
173	BELMANIP_00286	-29.72	126.492	LANDVAL V1.1
174	BELMANIP_00288	-25.361	115.907	LANDVAL V1.1
175	BELMANIP_00289	-20.2979	124.879	LANDVAL V1.1
176	BELMANIP_00291	-29.3847	133.247	LANDVAL V1.1
177	BELMANIP_00293	-21.5385	143.833	LANDVAL V1.1
178	BELMANIP_00294	-25.5287	137.985	LANDVAL V1.1
179	BELMANIP_00295	-28.58	140.203	LANDVAL V1.1
180	BELMANIP_00296	-16.4508	142.623	LANDVAL V1.1
181	BELMANIP_00297	-17.2387	122.964	LANDVAL V1.1

182	BELMANIP_00298	-16.2551	136.97	LANDVAL V1.1
183	BELMANIP_00299	-16.2663	141.917	LANDVAL V1.1
184	BELMANIP_00300	-19.0829	123.669	LANDVAL V1.1
185	BELMANIP_00301	-19.4853	137.179	LANDVAL V1.1
186	BELMANIP_00306	-1.77321	103.506	LANDVAL V1.1
187	BELMANIP_00310	9.73779	122.762	LANDVAL V1.1
188	BELMANIP_00313	18.4584	82.0494	LANDVAL V1.1
189	BELMANIP_00317	15.8126	103.103	LANDVAL V1.1
190	BELMANIP_00318	10.7219	105.679	LANDVAL V1.1
191	BELMANIP_00321	22.493	81.8757	LANDVAL V1.1
192	BELMANIP_00332	29.8363	74.8747	LANDVAL V1.1
193	BELMANIP_00333	28.063	76.6651	LANDVAL V1.1
194	BELMANIP_00334	26.6631	85.4882	LANDVAL V1.1
195	BELMANIP_00335	25.712	88.1824	LANDVAL V1.1
196	BELMANIP_00336	21.1686	95.2395	LANDVAL V1.1
197	BELMANIP_00337	21.1464	106.022	LANDVAL V1.1
198	BELMANIP_00338	25.997	68.5234	LANDVAL V1.1
199	BELMANIP_00339	28.9142	60.7606	LANDVAL V1.1
200	BELMANIP_00340	27.6903	63.0793	LANDVAL V1.1
201	BELMANIP_00346	33.3648	86.3677	LANDVAL V1.1
202	BELMANIP_00348	34.8402	101.49	LANDVAL V1.1
203	BELMANIP_00350	37.2879	107.942	LANDVAL V1.1
204	BELMANIP_00353	33.9349	74.8747	LANDVAL V1.1
205	BELMANIP_00354	31.6053	73.4522	LANDVAL V1.1
206	BELMANIP_00355	31.1183	105.623	LANDVAL V1.1
207	BELMANIP_00356	32.7817	115.555	LANDVAL V1.1
208	BELMANIP_00357	36.0896	140.036	LANDVAL V1.1
209	BELMANIP_00359	30.783	63.4826	LANDVAL V1.1
210	BELMANIP_00363	44.6055	131.331	LANDVAL V1.1
211	BELMANIP_00366	42.0571	108.648	LANDVAL V1.1
212	BELMANIP_00367	42.208	115.403	LANDVAL V1.1
213	BELMANIP_00368	49.7357	68.2209	LANDVAL V1.1
214	BELMANIP_00369	47.1706	97.3566	LANDVAL V1.1
215	BELMANIP_00370	47.2209	106.329	LANDVAL V1.1
216	BELMANIP_00371	42.2416	111.067	LANDVAL V1.1
217	BELMANIP_00373	45.6682	122.592	LANDVAL V1.1
218	BELMANIP_00375	40.6656	62.8777	LANDVAL V1.1
219	BELMANIP_00376	44.3875	62.172	LANDVAL V1.1
220	BELMANIP_00377	45.7623	68.725	LANDVAL V1.1
221	BELMANIP_00378	46.0473	76.0845	LANDVAL V1.1
222	BELMANIP_00380	48.6248	93.4382	LANDVAL V1.1
223	BELMANIP_00381	44.2031	106.833	LANDVAL V1.1
224	BELMANIP_00382	41.2189	93.2232	LANDVAL V1.1
225	BELMANIP_00383	40.2632	101.994	LANDVAL V1.1
226	BELMANIP_00384	57.5562	73.9674	LANDVAL V1.1
227	BELMANIP_00385	57.7574	89.2914	LANDVAL V1.1

228	BELMANIP_00386	59.3165	92.4166	LANDVAL V1.1
229	BELMANIP_00387	54.8402	97.7598	LANDVAL V1.1
230	BELMANIP_00389	59.0483	107.539	LANDVAL V1.1
231	BELMANIP_00390	55.4132	122.328	LANDVAL V1.1
232	BELMANIP_00391	59.0651	130.122	LANDVAL V1.1
233	BELMANIP_00393	51.3865	132.944	LANDVAL V1.1
234	BELMANIP_00394	55.6114	86.6702	LANDVAL V1.1
235	BELMANIP_00397	56.5167	69.5315	LANDVAL V1.1
236	BELMANIP_00398	51.3195	119.435	LANDVAL V1.1
237	BELMANIP_00399	50.1459	67.8177	LANDVAL V1.1
238	BELMANIP_00401	59.5513	80.6212	LANDVAL V1.1
239	BELMANIP_00402	51.6883	63.1802	LANDVAL V1.1
240	BELMANIP_00403	51.9398	68.1201	LANDVAL V1.1
241	BELMANIP_00407	62.3589	97.0541	LANDVAL V1.1
242	BELMANIP_00408	63.5995	107.337	LANDVAL V1.1
243	BELMANIP_00409	68.4112	120.343	LANDVAL V1.1
244	BELMANIP_00410	61.7218	113.89	LANDVAL V1.1
245	BELMANIP_00411	62.6104	122.157	LANDVAL V1.1
246	BELMANIP_00412	62.3589	133.045	LANDVAL V1.1
247	BELMANIP_00413	67.925	147.563	LANDVAL V1.1
248	BELMANIP_00416	69.1656	101.792	LANDVAL V1.1
249	BELMANIP_00417	69.9201	150.99	LANDVAL V1.1
250	BELMANIP_00424	43.3705	108.915	LANDVAL V1.1
251	BELMANIP_00425	24.8705	-14.4777	LANDVAL V1.1
252	BELMANIP_00429	45.1741	102.621	LANDVAL V1.1
253	BELMANIP_00430	38.692	89.567	LANDVAL V1.1
254	BELMANIP_00431	-9.40425	-53.7166	LANDVAL V1.1
255	BELMANIP_00432	-15.4935	-66.2564	LANDVAL V1.1
256	BELMANIP_00433	-12.0589	-67.1189	LANDVAL V1.1
257	BELMANIP_00434	-4.60607	-60.3355	LANDVAL V1.1
258	BELMANIP_00435	-3.80793	-72.5893	LANDVAL V1.1
259	BELMANIP_00436	3.04846	-69.8396	LANDVAL V1.1
260	BELMANIP_00437	0.191078	-53.388	LANDVAL V1.1
261	BELMANIP_00438	0.776286	-62.6511	LANDVAL V1.1
262	BELMANIP_00440	26.79	97.5619	LANDVAL V1.1
263	BELMANIP_00441	13.8666	106.36	LANDVAL V1.1
264	BELMANIP_00442	13.0816	105.707	LANDVAL V1.1
265	BELMANIP_00443	-2.61772	113.879	LANDVAL V1.1
266	BELSK	51.8367	20.7917	LANDVAL V1.1
267	BEN_SALEM	35.5505	9.914	LANDVAL V1.1
268	BERMS_BOREAS	53.65	-105.32	LANDVAL V1.1
269	BHOLA	22.1667	90.75	LANDVAL V1.1
270	BIL	36.605	-97.516	LANDVAL V1.1
271	BIRDSVILLE	-25.8989	139.346	LANDVAL V1.1
272	BON	40.0667	-88.3667	LANDVAL V1.1
273	BONDOUKOUI	11.85	-3.75	LANDVAL V1.1

274	BONDVILLE	40.0533	-88.3719	LANDVAL V1.1
275	BOU	40.05	-105.007	LANDVAL V1.1
276	BOUMBA_BEK	3.095	14.612	LANDVAL V1.1
277	BR-JI1	-10.7618	-62.3572	LANDVAL V1.1
278	BR-MA2	-2.6091	-60.2093	LANDVAL V1.1
279	BR-SA1	-2.85667	-54.9589	LANDVAL V1.1
280	BR-SA3	-3.01803	-54.9714	LANDVAL V1.1
281	BRAKE	53.286	8.367	LANDVAL V1.1
282	BRATTS_LAKE	50.28	-104.7	LANDVAL V1.1
283	BURE_OPE	48.5625	5.505	LANDVAL V1.1
284	BUSHLAND	35.1868	-102.094	LANDVAL V1.1
285	BW-GHG	-21.51	21.74	LANDVAL V1.1
286	BW-GHM	-21.2	21.75	LANDVAL V1.1
287	BW-MA1	-19.9155	23.5605	LANDVAL V1.1
288	CA-LET	49.7093	-112.94	LANDVAL V1.1
289	CA-NS4	55.9117	-98.3822	LANDVAL V1.1
290	CA-OJP	53.9163	-104.692	LANDVAL V1.1
291	CA-SF1	54.485	-105.818	LANDVAL V1.1
292	CA-SJ1	53.908	-104.656	LANDVAL V1.1
293	CA-SJ3	53.8758	-104.645	LANDVAL V1.1
294	CA-TP1	42.6609	-80.5595	LANDVAL V1.1
295	CA-TP2	42.7744	-80.4588	LANDVAL V1.1
296	CALIPSO_CROUSE_MILL	38.9585	-75.9516	LANDVAL V1.1
297	CALIPSO_STRASBURG	39.9345	-76.2193	LANDVAL V1.1
298	CALIPSO_W_STRASBURG	39.9465	-76.2311	LANDVAL V1.1
299	CALIPSO_ZION	39.9324	-76.199	LANDVAL V1.1
300	CAMAGUEY	21.4223	-77.8499	LANDVAL V1.1
301	CAMPO_VERDE	-15.5617	-55.175	LANDVAL V1.1
302	CARDENA	38.3	-4.45	LANDVAL V1.1
303	CARLSBAD	32.3688	-104.233	LANDVAL V1.1
304	CART_SITE	36.6067	-97.4864	LANDVAL V1.1
305	CHINA_LAKE	35.6741	-117.745	LANDVAL V1.1
306	CHITRAKOOT	25.1479	80.8552	LANDVAL V1.1
307	CN-BED	39.5306	116.252	LANDVAL V1.1
308	CN-DU2	42.0467	116.284	LANDVAL V1.1
309	CN-KU1	40.5383	108.694	LANDVAL V1.1
310	CN-KU2	40.3808	108.549	LANDVAL V1.1
311	CN-XFS	44.1342	116.329	LANDVAL V1.1
312	CUIABA	-15.5	-56	LANDVAL V1.1
313	CUIABA-MIRANDA	-15.7295	-56.0208	LANDVAL V1.1
314	DAA	-30.6667	23.993	LANDVAL V1.1
315	DALANZADGAD	43.5772	104.419	LANDVAL V1.1
316	DE-GRI	50.9495	13.5125	LANDVAL V1.1
317	DE-HAI	51.0793	10.452	LANDVAL V1.1
318	DE-WET	50.4535	11.4575	LANDVAL V1.1
319	DEAD_HORSE	69.4283	-148.698	LANDVAL V1.1

320	DESERT_ROCK	36.6232	-116.02	LANDVAL V1.1
321	DIRECT_00001 - AGRO	40.0066	-88.2917	LANDVAL V1.1
322	DIRECT_00007 - SEVI	34.3509	-106.69	LANDVAL V1.1
323	DIRECT_00008 - TAPA	-2.86954	-54.9495	LANDVAL V1.1
324	DIRECT_00039 - WatsonLake1	60.1005	-129.69	LANDVAL V1.1
325	DIRECT_00044 - WalnutCreek	41.9322	-93.751	LANDVAL V1.1
326	DIRECT_00047 - LosInocentes	11.0331	-85.5028	LANDVAL V1.1
327	DIRECT_00048 - AekLoba	2.63102	99.5763	LANDVAL V1.1
328	DIRECT_00051 - Barrax	39.0728	-2.10395	LANDVAL V1.1
329	DIRECT_00052 - Camerons	-32.5983	116.254	LANDVAL V1.1
330	DIRECT_00053 - Concepcion	-37.4671	-73.4706	LANDVAL V1.1
331	DIRECT_00054 - Counami	5.34714	-53.2378	LANDVAL V1.1
332	DIRECT_00055 - Counami2	5.34346	-53.2368	LANDVAL V1.1
333	DIRECT_00056 - Demmin	53.8925	13.2072	LANDVAL V1.1
334	DIRECT_00060 - Gourma	15.3247	-1.55464	LANDVAL V1.1
335	DIRECT_00061 - Haouz	31.6593	-7.60029	LANDVAL V1.1
336	DIRECT_00065 - Laprida	-36.9904	-60.5526	LANDVAL V1.1
337	DIRECT_00069 - PlanDeDieu	44.1987	4.94813	LANDVAL V1.1
338	DIRECT_00071 - Romilly	48.4432	3.77199	LANDVAL V1.1
339	DIRECT_00075 - Turco	-18.235	-68.1836	LANDVAL V1.1
340	DIRECT_00076 - Turco2	-18.2395	-68.1933	LANDVAL V1.1
341	DIRECT_00077 - Wankamana	13.645	2.63534	LANDVAL V1.1
342	DIRECT_00079 - Chimbolton	51.164	-1.43064	LANDVAL V1.1
343	DIRECT_00083 - Maun	-19.9217	23.5908	LANDVAL V1.1
344	DIRECT_00085 - GuyaFlux	5.2817	-52.9122	LANDVAL V1.1
345	DIRECT_00086 - Dahra_South	15.4119	-15.4335	LANDVAL V1.1
346	DIRECT_00087 - Dahra_North	15.4316	-15.4034	LANDVAL V1.1
347	DIRECT_00088 - Tessekre_South	15.8192	-15.0609	LANDVAL V1.1
348	DIRECT_00089 - Tessekre_North	15.896	-15.0609	LANDVAL V1.1
349	DIRECT_00092 - Bundongo_1	1.6909	31.4318	LANDVAL V1.1
350	DIRECT_00093 - Bundongo_2	1.7532	31.4891	LANDVAL V1.1
351	DIRECT_00094 - Bundongo_3	1.7654	31.5297	LANDVAL V1.1
352	DIRECT_00095 - Bundongo_4	1.723	31.6372	LANDVAL V1.1
353	DIRECT_00096 - Bundongo_5	1.7278	31.5805	LANDVAL V1.1
354	DIRECT_00097 - Bundongo_6	1.8042	31.6047	LANDVAL V1.1
355	DIRECT_00098 - Bundongo_7	1.7858	31.5641	LANDVAL V1.1
356	DIRECT_00099 - Bundongo_8	1.7654	31.6146	LANDVAL V1.1
357	DIRECT_00102 - Tshane	-24.1641	21.8929	LANDVAL V1.1
358	DIRECT_00104 - Harth Forest	47.8211	7.45539	LANDVAL V1.1
359	DIRECT_00106 - Koscianski (PL)	52.03	16.83	LANDVAL V1.1
360	DIRECT_00108 - Brotas	-22.22	-48.15	LANDVAL V1.1
361	DIRECT_00109 - Brotas2	-22.35	-46.37	LANDVAL V1.1
362	DIRECT_00110 - Yatir Forest	31.35	35.0333	LANDVAL V1.1
363	DIRECT_00111 - Chize1	46.1636	-0.477083	LANDVAL V1.1
364	DIRECT_00112 - Chize2	46.2898	-0.343625	LANDVAL V1.1
365	DJOUGOU	9.76007	1.59901	LANDVAL V1.1

366	DK-RIS	55.5303	12.0972	LANDVAL V1.1
367	DRA	36.626	-116.018	LANDVAL V1.1
368	DRAGON_ALDINO	39.5634	-76.2039	LANDVAL V1.1
369	DRAGON_AURORA_EAST	39.6385	-104.569	LANDVAL V1.1
370	DRAGON_HURON	36.2062	-120.105	LANDVAL V1.1
371	DRAGON_NISHIHARIMA	35.026	134.336	LANDVAL V1.1
372	DRAGON_NW_HARRIS_CO	30.0394	-95.6739	LANDVAL V1.1
373	DRAGON_PARLIER	36.5974	-119.504	LANDVAL V1.1
374	DRAGON_PLATTEVILLE	40.1828	-104.726	LANDVAL V1.1
375	DRAGON_TRANQUILITY	36.6343	-120.382	LANDVAL V1.1
376	DRAGON_UH_W_LIBERTY	30.0583	-94.9781	LANDVAL V1.1
377	DUNHUANG1	40.13	94.34	LANDVAL V1.1
378	E13	36.605	-97.485	LANDVAL V1.1
379	EGBERT	44.2257	-79.75	LANDVAL V1.1
380	EL_FARAFRA	27.058	27.9902	LANDVAL V1.1
381	ETOSHA_PAN	-19.175	15.9144	LANDVAL V1.1
382	EVORA	38.5678	-7.9115	LANDVAL V1.1
383	FLORIDA_COASTAL_EVERGLADES_LTER_FCE	25.47	-80.85	LANDVAL V1.1
384	FORT_PECK	48.308	-105.102	LANDVAL V1.1
385	FOWLERS_GAP	-31.0863	141.701	LANDVAL V1.1
386	FPE	48.3167	-105.1	LANDVAL V1.1
387	FR-AUR	43.5494	1.10778	LANDVAL V1.1
388	FRENCHMAN_FLAT	36.8093	-115.935	LANDVAL V1.1
389	GF-GUY	5.2777	-52.9288	LANDVAL V1.1
390	GOB	-23.5614	15.042	LANDVAL V1.1
391	GUAL_PAHARI	28.4264	77.15	LANDVAL V1.1
392	HAND_N_60708	26.4718	80.5218	LANDVAL V1.1
393	HAND_S_50608	26.2856	80.4927	LANDVAL V1.1
394	HOMBURI	15.3292	-1.54667	LANDVAL V1.1
395	HORSEPOOL	40.144	-109.468	LANDVAL V1.1
396	IE-DRI	51.9867	-8.75181	LANDVAL V1.1
397	IER_CINZANA	13.2784	-5.93387	LANDVAL V1.1
398	IHOP-HOMESTEAD	36.5583	-100.606	LANDVAL V1.1
399	IL-YAT	31.345	35.0515	LANDVAL V1.1
400	IONA	-16.212	12.06	LANDVAL V1.1
401	IT-BE2	46.0031	13.0257	LANDVAL V1.1
402	IT-LEC	43.3046	11.2706	LANDVAL V1.1
403	IT-RO1	42.4081	11.93	LANDVAL V1.1
404	ITAJUBA	-22.4132	-45.4524	LANDVAL V1.1
405	IVANPAH_PLAYA	35.57	-115.4	LANDVAL V1.1
406	JAMARI	-8.63333	-62.75	LANDVAL V1.1
407	JAMTOWN	-9.2	-63.1	LANDVAL V1.1
408	JORNADA1	32.6	-106.86	LANDVAL V1.1
409	JORNADA_BASIN_LTER_JRN	32.62	-106.74	LANDVAL V1.1
410	JP-MAS	36.054	140.027	LANDVAL V1.1
411	KASAMA	-10.1667	31.1833	LANDVAL V1.1

412	KIRTLAND_AFB	34.9508	-106.507	LANDVAL V1.1
413	KONGO_00001	2.3353	26.0675	LANDVAL V1.1
414	KONGO_00002	-0.757	20.718	LANDVAL V1.1
415	KONZA	39.0825	-96.5597	LANDVAL V1.1
416	KONZAPRARIE	39.08	-96.56	LANDVAL V1.1
417	KULGUNINO	53.3	56.9	LANDVAL V1.1
418	LANNION	48.7308	-3.46194	LANDVAL V1.1
419	LATOYA	-15.6781	23.2999	LANDVAL V1.1
420	LIN	52.21	14.122	LANDVAL V1.1
421	LITANG	29.9763	100.262	LANDVAL V1.1
422	LOS_FIEROS	-14.55	-60.6167	LANDVAL V1.1
423	LUMBINI	27.49	83.28	LANDVAL V1.1
424	LUT_DESERT_00001	30.593	58.228	LANDVAL V1.1
425	LW-SCAN	34.9605	-97.9788	LANDVAL V1.1
426	MANAUS	-2.59908	-60.0386	LANDVAL V1.1
427	MANAUS_EMBRAPA	-2.89053	-59.9698	LANDVAL V1.1
428	MANDALGOBI	45.995	106.327	LANDVAL V1.1
429	MARTINENI	45.92	26.08	LANDVAL V1.1
430	METOBS_LINDENBERG	52.2093	14.1209	LANDVAL V1.1
431	METOLIUSYP	44.43	-121.56	LANDVAL V1.1
432	MOBILE_KANPUR_W2	26.4185	80.1217	LANDVAL V1.1
433	MOBILE_N_60708	26.5307	80.5057	LANDVAL V1.1
434	MOBILE_S_50608	26.1251	80.5328	LANDVAL V1.1
435	MONKS_WOOD	52.4022	-0.235211	LANDVAL V1.1
436	MUBFS	0.566667	30.3667	LANDVAL V1.1
437	MUKDAHAN	16.6067	104.676	LANDVAL V1.1
438	ND_MARBEL_UNIV	6.49601	124.843	LANDVAL V1.1
439	NEGEV	30.11	35.01	LANDVAL V1.1
440	NEON-CPER	40.8124	-104.744	LANDVAL V1.1
441	NEON17-SJER	37.0904	-119.722	LANDVAL V1.1
442	NEON_IVANPAH	35.5507	-115.382	LANDVAL V1.1
443	NEON_STERLING	40.4619	-103.029	LANDVAL V1.1
444	NIABRARA	42.7648	-100.02	LANDVAL V1.1
445	NSA_YJP_BOREAS	55.903	-98.29	LANDVAL V1.1
446	OK_ST_UNIV	35.0456	-97.9173	LANDVAL V1.1
447	OMANI_DESERT	19	55.5	LANDVAL V1.1
448	OMKOI	17.7983	98.4317	LANDVAL V1.1
449	ORLEAN_BRICY	47.9867	1.76111	LANDVAL V1.1
450	ORS_HERMOSILLO	29.0275	-111.146	LANDVAL V1.1
451	PADDOCKWOOD	53.5	-105.5	LANDVAL V1.1
452	PANTNAGAR	29.0463	79.5209	LANDVAL V1.1
453	PAYERNE	46.815	6.944	LANDVAL V1.1
454	PFAELZER_WALD	49.325	7.94	LANDVAL V1.1
455	PIMAI	15.1819	102.564	LANDVAL V1.1
456	PKU_PEK	39.593	116.184	LANDVAL V1.1
457	PORTO_NACIONAL	-11	-48	LANDVAL V1.1

458	PULLMAN	46.75	-117.192	LANDVAL V1.1
459	PUSPIPTEK	-6.3556	106.664	LANDVAL V1.1
460	QOZ_EL_HARR	16.71	32.68	LANDVAL V1.1
461	RAS_EL_AIN	31.6703	-7.59944	LANDVAL V1.1
462	RED_RIVER_DELTA	20.7285	106.128	LANDVAL V1.1
463	REGINA	50.205	-104.713	LANDVAL V1.1
464	SAADA	31.6258	-8.15583	LANDVAL V1.1
465	SAIH_SALAM	24.8295	55.3128	LANDVAL V1.1
466	SALONGA	-1.462	21.518	LANDVAL V1.1
467	SAO_MARTINHO_SONDA	-29.4433	-53.8234	LANDVAL V1.1
468	SBO	30.8597	34.7794	LANDVAL V1.1
469	SEDE_BOKER	30.855	34.7822	LANDVAL V1.1
470	SELIM	40.45	42.83	LANDVAL V1.1
471	SEVILLETA1	34.344	-106.671	LANDVAL V1.1
472	SHORTGRASS_STEPPE_SGS	40.83	-104.72	LANDVAL V1.1
473	SIOUX_FALLS_X	43.7363	-96.626	LANDVAL V1.1
474	SMART	24.2493	55.6121	LANDVAL V1.1
475	SMEX	41.936	-93.664	LANDVAL V1.1
476	SMS	-29.4428	-53.8231	LANDVAL V1.1
477	SOLAR_VILLAGE	24.9069	46.3973	LANDVAL V1.1
478	SOLWEZI	-12.1707	26.3633	LANDVAL V1.1
479	SOV	24.91	46.41	LANDVAL V1.1
480	SS_OJP_BOREAS	53.916	-104.69	LANDVAL V1.1
481	STRZYZOW	49.8786	21.8613	LANDVAL V1.1
482	SUFFIELD	50.2816	-111.131	LANDVAL V1.1
483	SXF	43.73	-96.62	LANDVAL V1.1
484	T1_MAX_MEX	19.7031	-98.9819	LANDVAL V1.1
485	TABERNAS_PSA-DLR	37.0908	-2.35818	LANDVAL V1.1
486	TAPAJOS	-2.857	-54.959	LANDVAL V1.1
487	THALA	35.55	8.68333	LANDVAL V1.1
488	TINGA_TINGANA (*)	-28.9758	139.991	LANDVAL V1.1
489	TOMBSTONE	31.742	-110.05	LANDVAL V1.1
490	TONOPAH_AIRPORT	38.0504	-117.091	LANDVAL V1.1
491	UK-AMO	55.7917	-3.23889	LANDVAL V1.1
492	UK-ESA	55.9069	-2.85861	LANDVAL V1.1
493	UK-TAD	51.2071	-2.82864	LANDVAL V1.1
494	UPPER_BUFFALO	35.8258	-93.203	LANDVAL V1.1
495	US-ARM	36.6058	-97.4888	LANDVAL V1.1
496	US-AUD	31.5907	-110.51	LANDVAL V1.1
497	US-BO1	40.0062	-88.2904	LANDVAL V1.1
498	US-FPE	48.3077	-105.102	LANDVAL V1.1
499	US-FUF	35.089	-111.762	LANDVAL V1.1
500	US-FWF	35.4454	-111.772	LANDVAL V1.1
501	US-IVO	68.4865	-155.75	LANDVAL V1.1
502	US-ME2	44.4523	-121.557	LANDVAL V1.1
503	US-NE1	41.1651	-96.4766	LANDVAL V1.1

504	US-SP1	29.7381	-82.2188	LANDVAL V1.1
505	US-SP2	29.7648	-82.2448	LANDVAL V1.1
506	US-SP4	29.8028	-82.2031	LANDVAL V1.1
507	US-SRM	31.8214	-110.866	LANDVAL V1.1
508	US-TON	38.4316	-120.966	LANDVAL V1.1
509	US-VAR	38.4133	-120.951	LANDVAL V1.1
510	US-WKG	31.7365	-109.942	LANDVAL V1.1
511	USSURIYSK	43.7004	132.163	LANDVAL V1.1
512	WADI_ABU_GEIDUM	16.2	32.93	LANDVAL V1.1
513	WALNUTGULCH	31.737	-109.942	LANDVAL V1.1
514	WAV_AN_NAMUS	24.918	17.794	LANDVAL V1.1
515	WHITE_SANDS_HELSTF	32.6349	-106.338	LANDVAL V1.1
516	YAQUI	27.2808	-109.912	LANDVAL V1.1
517	YUFA_PEK	39.309	116.184	LANDVAL V1.1
518	ZOUERATE-FENNEC	22.75	-12.4833	LANDVAL V1.1
519	Arabia#1	18.88	46.76	LANDVAL V1.1
520	Arabia#2	20.13	50.96	LANDVAL V1.1
521	Arabia#3	28.92	43.73	LANDVAL V1.1
522	Sudan#1	21.74	28.22	LANDVAL V1.1
523	Niger#1	19.67	9.81	LANDVAL V1.1
524	Niger#2	21.37	10.59	LANDVAL V1.1
525	Niger#3	21.57	7.96	LANDVAL V1.1
526	Egypt#1	27.12	26.1	LANDVAL V1.1
527	Libya#1	24.42	13.35	LANDVAL V1.1
528	Libya#2	25.05	20.48	LANDVAL V1.1
529	Libya#3	23.15	23.1	LANDVAL V1.1
530	Libya#4	28.55	23.39	LANDVAL V1.1
531	Algeria#1	23.8	-0.4	LANDVAL V1.1
532	Algeria#2	26.09	-1.38	LANDVAL V1.1
533	Algeria#3	30.32	7.66	LANDVAL V1.1
534	Algeria#4	30.04	5.59	LANDVAL V1.1
535	Algeria#5	31.02	2.23	LANDVAL V1.1
536	Mali#1	19.12	-4.85	LANDVAL V1.1
537	Mauritania#1	19.4	-9.3	LANDVAL V1.1
538	Mauritania#2	20.85	-8.78	LANDVAL V1.1
539	Collelongo	41.85	13.59	LANDVAL V1.1
540	25de Mayo_Shurb	-37.939	-67.789	LANDVAL V1.1
541	Bagci Koyu	37.9063	39.4419	LANDVAL V1.1
542	Chukotka	62.9063	173.451	LANDVAL V1.1
543	Sopka Taunshits	54.4241	159.862	LANDVAL V1.1
544	Krai de Krasnoyarsk	67.1295	92.0044	LANDVAL V1.1
545	Sptin Nuur	48.7634	88.3883	LANDVAL V1.1
546	Tagchagpu Ri	32.942	82.7009	LANDVAL V1.1
547	Akkacheruvu	15.7456	79.1384	LANDVAL V1.1
548	Kukushili	35.4063	85.4241	LANDVAL V1.1
549	Makanchi	46.6741	82.4062	LANDVAL V1.1

550	Shiyli	50.1652	63.3616	LANDVAL V1.1
551	Otgon	47.3973	97.4419	LANDVAL V1.1
552	Kumana National Park	6.57591	81.5669	LANDVAL V1.1
553	Nallamala Forest	15.6027	78.7366	LANDVAL V1.1
554	Anshi National Park	15.0223	74.4062	LANDVAL V1.1
555	IN-Brk	30.1107	78.2034	LANDVAL V1.1
556	IN-Bet	21.863	77.426	LANDVAL V1.1
557	JP-Tef	45.0563	142.106	LANDVAL V1.1
558	CN-Xg2	44.0889	113.574	LANDVAL V1.1
559	KR-Seo	37.9389	126.955	LANDVAL V1.1
560	JP-MBF	44.3842	142.319	LANDVAL V1.1
561	MY-Sbu	2.18667	111.843	LANDVAL V1.1
562	RU-Tuv	50.15	94.45	LANDVAL V1.1
563	CN-Xi1	43.5544	116.28	LANDVAL V1.1
564	Baikyt	62.1116	98.4419	LANDVAL V1.1
565	Muhar	26.9152	70.058	LANDVAL V1.1
566	Mirni	61.7188	113.897	LANDVAL V1.1
567	Irkutsk	58.9152	114.995	LANDVAL V1.1
568	Zabaikalie	55.5223	119.192	LANDVAL V1.1
569	Jabarovsk	49.4152	132.478	LANDVAL V1.1
570	Birobidzhan	49.0223	133.138	LANDVAL V1.1
571	Chebailing	24.7009	114.237	LANDVAL V1.1
572	Kamchatka	62.2545	164.647	LANDVAL V1.1
573	Mayskoye	50.9509	78.5937	LANDVAL V1.1
574	Kayrakty	48.3348	73.308	LANDVAL V1.1
575	Saja_1	56.567	123.772	LANDVAL V1.1
576	Saja_2	56.7634	124.201	LANDVAL V1.1
577	Saja_3	57.1295	124.272	LANDVAL V1.1
578	Saja_4	62.308	143.603	LANDVAL V1.1
579	Saja_5	63.2813	146.317	LANDVAL V1.1
580	Kamchatka_2	61.8438	164.96	LANDVAL V1.1
581	Man Na-hkai	23.5402	98.2991	LANDVAL V1.1
582	Tov_1	47.3259	106.094	LANDVAL V1.1
583	Tov_2	47.1295	107.567	LANDVAL V1.1
584	NARMA Niger_1 (*)	15	2	LANDVAL V1.1
585	NARMA Niger_2 (*)	15	12	LANDVAL V1.1
586	NARMA Mali_1	14.5	-5.75	LANDVAL V1.1
587	NARMA Niger_4	12.442	2.61161	LANDVAL V1.1
588	NARMA Botswana_1	-20.0293	21.4947	LANDVAL V1.1
589	NARMA Tanzania_1	-2.6875	36.5446	LANDVAL V1.1
590	NARMA Chad	9.28124	15.2723	LANDVAL V1.1
591	Siifan	4.92412	43.058	LANDVAL V1.1
592	Jariiban	7.49555	48.8884	LANDVAL V1.1
593	Hail	28.3438	40.2276	LANDVAL V1.1
594	Bargaal	11.5491	50.9241	LANDVAL V1.1
595	Zinder	15.442	8.15622	LANDVAL V1.1

596	Diffa	14.6741	13.2812	LANDVAL V1.1
597	Amhara	11.6652	36.558	LANDVAL V1.1
598	Niassa_1	-14.6562	37.0223	LANDVAL V1.1
599	Niassa_2	-14.1294	36.6205	LANDVAL V1.1
600	Somalia_1	10.9777	50.9419	LANDVAL V1.1
601	Somalia_2	50.2723	11.433	LANDVAL V1.1
602	Somalia_3	11.0045	49.8169	LANDVAL V1.1
603	Mackay	-21.9598	129.745	LANDVAL V1.1
604	Alice Springs	-22.2826	133.249	LANDVAL V1.1
605	Calperum Chowilla	-34.0021	140.589	LANDVAL V1.1
606	Great Western	-30.1914	120.654	LANDVAL V1.1
607	Howard Springs	-12.4952	131.15	LANDVAL V1.1
608	Litchfield	-13.179	130.795	LANDVAL V1.1
609	Sturt Plains	-17.1512	133.351	LANDVAL V1.1
610	Canada_North1	63.6205	-117.442	LANDVAL V1.1
611	Canada_North2	63.3527	-138.683	LANDVAL V1.1
612	Canada_North3	64.5134	-106.156	LANDVAL V1.1
613	Canada_North4	67.7455	-115.004	LANDVAL V1.1
614	Canada_North5	65.933	95.1919	LANDVAL V1.1
615	Canada_North6	50.0491	-67.4688	LANDVAL V1.1
616	Canada_North7	52.442	-57.0491	LANDVAL V1.1
617	Piura	-5.39731	-80.4152	LANDVAL V1.1
618	Cienaga	-28.3884	-68.2902	LANDVAL V1.1
619	SalinerasLasPiletas	-14.6562	-75.4866	LANDVAL V1.1
620	Missao	-6.14731	-40.4598	LANDVAL V1.1
621	West Three	-13.2187	26.9509	LANDVAL V1.1
622	Namibe	-15.7991	12.4062	LANDVAL V1.1
623	Elba NP	22.9509	35.4419	LANDVAL V1.1
624	Hame	15.3706	21.8348	LANDVAL V1.1
625	Darfur	16.9063	24.5223	LANDVAL V1.1
626	Alto Mbomou	7.56698	24.7901	LANDVAL V1.1
627	Sodralekvattnet	60.1473	12.6919	LANDVAL V1.1
628	Jamtland	63.9955	13.4419	LANDVAL V1.1
629	Tangen	60.5848	11.4598	LANDVAL V1.1
630	Norrbotten	66.7634	22.2098	LANDVAL V1.1
631	Laponia	67.0313	26.2187	LANDVAL V1.1
632	Vitebsk	55.9598	28.4776	LANDVAL V1.1
633	Zakaznik Kremennoye	48.9866	38.183	LANDVAL V1.1
634	Riazan	54.9241	40.2991	LANDVAL V1.1
635	Oblast de Smolensk	54.6027	34.2901	LANDVAL V1.1
636	Rahim Yar Khan	28.3081	71.4062	LANDVAL V1.1
637	Khargai	35.0223	73.0491	LANDVAL V1.1
638	Aksai Chin	34.6027	79.4866	LANDVAL V1.1
639	Khizaw	37.933	71.2455	LANDVAL V1.1
640	Surjandain	37.4688	67.7009	LANDVAL V1.1
641	China_Desert1	39.692	84.933	LANDVAL V1.1

642	China_Desert2	39.3616	81.7455	LANDVAL V1.1
643	Yamalia-Memetsia1	63.317	77.3794	LANDVAL V1.1
644	Krai de Krasnoyarsk2	62.6563	90.7187	LANDVAL V1.1
645	Krai de Krasnoyarsk3	70.1652	93.2723	LANDVAL V1.1
646	Yamalia-Memetsia2	68.8705	80.8526	LANDVAL V1.1
647	Oblast de Irkutsk	61.3795	105.263	LANDVAL V1.1
648	Republica_Saja_1	60.5402	112.076	LANDVAL V1.1
649	Republica_Saja_2	62.0045	113.254	LANDVAL V1.1
650	Republica_Saja_3	63.058	116.094	LANDVAL V1.1
651	Republica_Saja_4	68.3884	119.924	LANDVAL V1.1
652	Republica_Saja_5	62.7277	124.156	LANDVAL V1.1
653	Krai_de_Krasnoyarsk_1	65.6295	84.558	LANDVAL V1.1
654	Yamalia-Nenetsia_1	63.2366	81.3437	LANDVAL V1.1
655	Yamalia-Nenetsia_2	65.558	80.6473	LANDVAL V1.1
656	Yamalia-Nenetsia_3	67.067	82.2634	LANDVAL V1.1
657	Yamalia-Nenetsia_4	65.5491	80.6294	LANDVAL V1.1
658	Janty-Mansi_1	63.9866	68.1026	LANDVAL V1.1
659	Janty-Mansi_2	62.9598	66.3794	LANDVAL V1.1
660	Yamalia-Nenetsia_5	66.8884	66.6384	LANDVAL V1.1
661	Janty-Mansi_3	62.2455	62.7544	LANDVAL V1.1
662	Aksu	41.1741	81.3526	LANDVAL V1.1
663	China_Desert3	40.9152	86.4241	LANDVAL V1.1
664	Nagqu	31.1563	92.9598	LANDVAL V1.1
665	Wuxizuo	28.8081	109.87	LANDVAL V1.1
666	Shanjiao	25.5491	107.085	LANDVAL V1.1
667	Chita_1	50.4241	111.138	LANDVAL V1.1
668	Chita_2	50.3438	114.603	LANDVAL V1.1
669	Yamalia-Nenetsia_6	69.0402	115.71	LANDVAL V1.1
670	Republica_Saja_6	72.6384	115.522	LANDVAL V1.1
671	Republica_Saja_7	67.2723	111.62	LANDVAL V1.1
672	Krai_de_Krasnoyarsk_2	70.9955	107.531	LANDVAL V1.1
673	Republica_Saja_8	71.0938	134.978	LANDVAL V1.1
674	Republica_Saja_9	69.317	133.781	LANDVAL V1.1
675	Republica_Saja_10	70.2991	130.853	LANDVAL V1.1
676	Republica_Saja_11	67.2634	137.219	LANDVAL V1.1
677	Republica_Saja_12	69.7277	139.54	LANDVAL V1.1
678	Chukotka_2	66.9241	162.379	LANDVAL V1.1
679	Chukotka_3	66.0402	168.013	LANDVAL V1.1
680	Chukotka_4	68.0848	172.862	LANDVAL V1.1
681	Chukotka_5	66.5134	165.719	LANDVAL V1.1
682	Chukotka_6	66.9152	162.049	LANDVAL V1.1
683	Chukotka_7	66.8438	158.174	LANDVAL V1.1
684	Daxing angling_1	51.7634	125.031	LANDVAL V1.1
685	Jilin_1	43.067	127.46	LANDVAL V1.1
686	Jilin_2	41.8973	127.558	LANDVAL V1.1
687	Yichun_1	47.2277	128.71	LANDVAL V1.1

688	Yichun_2	49.0134	127.737	LANDVAL V1.1
689	Daxing angling_2	51.5848	124.817	LANDVAL V1.1
690	Santa Cruz	-50.6473	-71.1741	LANDVAL V1.1
691	Magallanes	-52.1205	-70.3706	LANDVAL V1.1
692	Goonoo State Forest	-31.9777	148.96	LANDVAL V1.1
693	Barakuyla	-26.3705	150.54	LANDVAL V1.1
694	Nowley	-29.9687	149.129	LANDVAL V1.1
695	Boatmat	-27.0491	146.879	LANDVAL V1.1
696	Omnogobi_1	42.9509	104.87	LANDVAL V1.1
697	Omnogobi_2	43.1384	101.629	LANDVAL V1.1
698	Omnogobi_3	43.8973	99.6026	LANDVAL V1.1
699	Sinkiang_1	45.6116	89.7455	LANDVAL V1.1
700	Sinkiang_2	45.442	87.7276	LANDVAL V1.1
701	Zhambyl_1	45.2545	72.0223	LANDVAL V1.1
702	Zhambyl_2	45.9688	69.5759	LANDVAL V1.1
703	Kyzylorda_1	44.3348	61.7455	LANDVAL V1.1
704	Kyzylorda_2	46.1384	64.0848	LANDVAL V1.1
705	Jilin_3	41.8527	127.683	LANDVAL V1.1
706	Pakistan_1	27.5402	63.0759	LANDVAL V1.1
707	Pakistan_2	25.2991	61.9776	LANDVAL V1.1
708	Chad_1	19.3527	22.8437	LANDVAL V1.1
709	Chad_2	18.3795	18.7187	LANDVAL V1.1
710	Mbomou	7.37055	25.0312	LANDVAL V1.1
711	Bouba Ndjida NP	8.17412	14.7276	LANDVAL V1.1
712	Bie	-11.0044	16.2901	LANDVAL V1.1
713	Katanga_1	-8.63838	27.5312	LANDVAL V1.1
714	Katanga_2	-10.6294	23.9776	LANDVAL V1.1
715	Hlane NP	-26.2848	31.8847	LANDVAL V1.1
716	Republica_Saja_16	63.5848	115.71	LANDVAL V1.1
717	Republica_Saja_13	63.7902	115.478	LANDVAL V1.1
718	Yakutsk	62.433	130.638	LANDVAL V1.1
719	Republica_Saja_14	59.8438	133.228	LANDVAL V1.1
720	Republica_Saja_15	60.0223	135.799	LANDVAL V1.1
721	AGRO	40.0066417	-88.291694	DIRECT 2.1
722	CHEQ	45.945319	-90.27274	DIRECT 2.1
723	HARV	42.5287066	-72.17289	DIRECT 2.1
724	KONZ	39.08899	-96.571233	DIRECT 2.1
725	METL	44.450839	-121.57296	DIRECT 2.1
726	NOBS	55.88522	-98.47718	DIRECT 2.1
727	SEVI	34.350853	-106.689902	DIRECT 2.1
728	TAPA	-2.86954	-54.949467	DIRECT 2.1
729	TUND	71.271742	-156.61323	DIRECT 2.1
730	Alpilles1_BU	43.81146	4.74702	DIRECT 2.1
731	Flakaliden	64.114589	19.47305	DIRECT 2.1
732	Ruokolahti	61.526542	28.711339	DIRECT 2.1
733	Chateauguay1	44.905397	-74.358925	DIRECT 2.1

734	Chateauguay2	44.900955	-73.8061	DIRECT 2.1
735	Chateauguay3	44.62427	-74.36203	DIRECT 2.1
736	Chateauguay4	44.6192	-73.8128	DIRECT 2.1
737	Larose2	45.378358	-75.165452	DIRECT 2.1
738	SW-Ontario1	45.2912	-78.59904	DIRECT 2.1
739	SW-Ontario10	45.0815	-77.5122	DIRECT 2.1
740	SW-Ontario11	44.82613	-77.61336	DIRECT 2.1
741	SW-Ontario12	44.587533	-77.7069	DIRECT 2.1
742	SW-Ontario13 (*)	45.01166	-77.1666	DIRECT 2.1
743	SW-Ontario14	44.75677	-77.26954	DIRECT 2.1
744	SW-Ontario15	44.518616	-77.36473	DIRECT 2.1
745	SW-Ontario2	45.03442	-78.69448	DIRECT 2.1
746	SW-Ontario3	44.7945	-78.78273	DIRECT 2.1
747	SW-Ontario4	45.22274	-78.23564	DIRECT 2.1
748	SW-Ontario5	44.9664	-78.333	DIRECT 2.1
749	SW-Ontario6	44.72693	-78.42303	DIRECT 2.1
750	SW-Ontario7	45.152833	-77.8734	DIRECT 2.1
751	SW-Ontario8	44.89698	-77.97262	DIRECT 2.1
752	SW-Ontario9	44.6579	-78.0644	DIRECT 2.1
753	Thompson1	56.049719	-98.15788	DIRECT 2.1
754	Thompson2	55.780196	-98.1637	DIRECT 2.1
755	Thompson3	56.04549	-97.67587	DIRECT 2.1
756	Thompson4	55.776	-97.6855	DIRECT 2.1
757	Kejimikujik1	44.45312	-65.284309	DIRECT 2.1
758	Kejimikujik2	44.324943	-65.095346	DIRECT 2.1
759	WatsonLake1	60.10046	-129.68996	DIRECT 2.1
760	WatsonLake2	59.86307	-129.40397	DIRECT 2.1
761	WatsonLake3	60.00495	-128.92926	DIRECT 2.1
762	Appomattox	37.21834	-78.88382	DIRECT 2.1
763	Barrax2	39.02811	-2.074286	DIRECT 2.1
764	Walnut_Creek	41.9322077	-93.750976	DIRECT 2.1
765	Chamela	19.71243	-105.0109	DIRECT 2.1
766	Chamela2	19.5071	-104.8462	DIRECT 2.1
767	LosInocentes	11.0331	-85.50281	DIRECT 2.1
768	AekLoba	2.63102	99.57626	DIRECT 2.1
769	Alpilles1	43.80722	4.74252	DIRECT 2.1
770	Alpilles2	43.810353	4.71461	DIRECT 2.1
771	Barrax	39.0728491	-2.10395	DIRECT 2.1
772	Camerons	-32.5983451	116.254226	DIRECT 2.1
773	Concepcion	-37.467097	-73.470614	DIRECT 2.1
774	Counami	5.34714254	-53.2377928	DIRECT 2.1
775	Counami2	5.343461	-53.23683	DIRECT 2.1
776	Demmin	53.892507	13.207185	DIRECT 2.1
777	Fundulea	44.40604	26.58318	DIRECT 2.1
778	Gilching	48.08186	11.32035	DIRECT 2.1
779	Gnangara	-31.53385	115.882367	DIRECT 2.1

780	Gourma	15.324711	-1.554639	DIRECT 2.1
781	Haouz	31.659337	-7.600293	DIRECT 2.1
782	Hirsikangas	62.644	27.01161	DIRECT 2.1
783	Hombori	15.330976	-1.47505	DIRECT 2.1
784	Jarvselja	58.298663	27.2623013	DIRECT 2.1
785	Laprida	-36.99037	-60.552592	DIRECT 2.1
786	Larose	45.38057	-75.217001	DIRECT 2.1
787	Larzac	43.93751	3.12295	DIRECT 2.1
788	Nezer	44.56798	-1.03749	DIRECT 2.1
789	Plan_De_Dieu	44.19869	4.948133	DIRECT 2.1
790	Puechabon	43.7245823	3.65190347	DIRECT 2.1
791	Romilly	48.4431586	3.77199	DIRECT 2.1
792	Rovaniemi	66.45565	25.351035	DIRECT 2.1
793	Sonian	50.7681508	4.41108089	DIRECT 2.1
794	SudOuest	43.5063	1.23752	DIRECT 2.1
795	Turco	-18.235015	-68.183609	DIRECT 2.1
796	Turco2	-18.23945	-68.19333	DIRECT 2.1
797	Wankama	13.64504	2.63534	DIRECT 2.1
798	Zhang_Bei	41.27882	114.68778	DIRECT 2.1
799	Chimbolton	51.1640472	-1.43063682	DIRECT 2.1
800	Donga	9.77013132	1.77835012	DIRECT 2.1
801	Hyytiälä	61.8513277	24.3076085	DIRECT 2.1
802	Pandamatenga	-18.6486111	25.4952778	DIRECT 2.1
803	Maun	-19.9216667	23.5908333	DIRECT 2.1
804	Wiscousin	45.8042	-90.0799	DIRECT 2.1
805	Guyaflux	5.2817	-52.9122	DIRECT 2.1
806	Dahra_South	15.4119	-15.4335	DIRECT 2.1
807	Tessekre_South	15.8192	-15.0609	DIRECT 2.1
808	Tessekre_North	15.896	-15.0609	DIRECT 2.1
809	Kkmega_North	0.3204	34.8533	DIRECT 2.1
810	kkmega_South	0.2649	34.8768	DIRECT 2.1
811	Budongo_1	1.6909	31.4318	DIRECT 2.1
812	Budongo_2	1.7532	31.4891	DIRECT 2.1
813	Budongo_3	1.7654	31.5297	DIRECT 2.1
814	Budongo_4	1.723	31.6372	DIRECT 2.1
815	Budongo_5	1.7278	31.5805	DIRECT 2.1
816	Budongo_6	1.8042	31.6047	DIRECT 2.1
817	Budongo_7	1.7858	31.5641	DIRECT 2.1
818	Budongo_8	1.7654	31.6146	DIRECT 2.1
819	Utiel	39.5807	-1.2646	DIRECT 2.1
820	Okwa	-22.4092932	21.7129593	DIRECT 2.1
821	Tshane	-24.1640693	21.8928712	DIRECT 2.1
822	Mongu	-15.437894	23.2527028	DIRECT 2.1
823	Harth Forest	47.80555	7.45	DIRECT 2.1
824	Marmande	44.4608	0.2055	DIRECT 2.1
825	Pshenichne	50.0765683	30.2322389	DIRECT 2.1

826	Merguellil	35.5662166	9.9121621	DIRECT 2.1
827	SouthWest_1	43.5511111	1.088889	DIRECT 2.1
828	SouthWest_2	43.44708	1.14505	DIRECT 2.1
829	Guangdong-Xuwen	20.837	110.111	DIRECT 2.1
830	25de Mayo_Alfalfa	-37.906519	-67.745928	DIRECT 2.1
831	25de Mayo_Shurb	-37.938983	-67.789014	DIRECT 2.1
832	Rosasco	45.253	8.562	DIRECT 2.1
833	LaReina_Cordoba_1	37.8189	-4.8624	DIRECT 2.1
834	LaReina_Cordoba_2	37.7929	-4.82668	DIRECT 2.1
835	Barrax-LasTiesas	39.054371	-2.10067685	DIRECT 2.1
836	Albufera	39.274369	-0.316439	DIRECT 2.1
837	Ottawa	45.3056	-75.7673	DIRECT 2.1
838	SanFernando	-34.72275	-71.0019	DIRECT 2.1
839	AHSPECT-MTO	43.572812	1.374512	DIRECT 2.1
840	AHSPECT-PEY	43.666229	0.21954	DIRECT 2.1
841	AHSPECT-URG	43.639704	-0.433956	DIRECT 2.1
842	AHSPECT-CRE	43.993601	-0.046897	DIRECT 2.1
843	AHSPECT-CON	43.97429	0.335969	DIRECT 2.1
844	AHSPECT-SAV	43.824221	1.174945	DIRECT 2.1
845	Collelongo	41.85	13.59	DIRECT 2.1
846	Capitanata	41.463668	15.4867109	DIRECT 2.1
847	Muragua-Upper-Tana	-0.772022	36.9742	DIRECT 2.1
848	Wielkopolska	52.060001	16.799999	DIRECT 2.1
849	Liria	39.75191	-0.700515	DIRECT 2.1
850	Moncada	39.52045	-0.38697	DIRECT 2.1
851	Wyhtam	51.7651748	-1.32379024	DIRECT 2.1
852	Honghe_A	47.667	133.515	DIRECT 2.1
853	Honghe_B	47.663	133.532	DIRECT 2.1
854	Honghe_C	47.653	133.523	DIRECT 2.1
855	Honghe_D	47.637	133.515	DIRECT 2.1
856	Honghe_E	47.637	133.534	DIRECT 2.1
857	Hailun_A	47.41	126.838	DIRECT 2.1
858	Hailun_B	47.405	126.838	DIRECT 2.1
859	Hailun_C	47.401	126.805	DIRECT 2.1
860	Hailun_D	47.409	126.798	DIRECT 2.1
861	Hailun_E	47.429	126.801	DIRECT 2.1
862	BJ_wheat_1	40.227319	116.810934	DIRECT 2.1
863	BJ_wheat_2	40.171815	116.572203	DIRECT 2.1
864	BJ_wheat_3	40.204609	116.357673	DIRECT 2.1
865	BJ_wheat_8	40.172928	116.581005	DIRECT 2.1
866	HN_wheat_2	35.140285	113.023828	DIRECT 2.1
867	HN_wheat_5	33.812581	114.632947	DIRECT 2.1
868	HN_wheat_6	35.116179	112.993279	DIRECT 2.1
869	HN_wheat_8	34.956114	112.762712	DIRECT 2.1
870	HN_wheat_14	33.739831	114.690637	DIRECT 2.1
871	HN_wheat_16	33.719732	114.375261	DIRECT 2.1

872	HLJ_barley_1	46.802066	131.805452	DIRECT 2.1
873	HLJ_barley_2	46.795366	131.895485	DIRECT 2.1
874	HLJ_barley_3	46.787292	131.886516	DIRECT 2.1
875	HLJ_barley_4	46.785929	131.976608	DIRECT 2.1
876	HLJ_barley_8	46.740232	131.759142	DIRECT 2.1
877	HLJ_barley_13	46.713749	131.715004	DIRECT 2.1
878	HLJ_barley_14	46.750352	131.839151	DIRECT 2.1
879	HLJ_barley_16	46.725275	131.899513	DIRECT 2.1
880	HLJ_barley_19	46.701173	131.867143	DIRECT 2.1
881	HLJ_wheat_1	46.967882	131.972769	DIRECT 2.1
882	HLJ_wheat_2	46.962059	131.989009	DIRECT 2.1
883	HLJ_wheat_3	46.938952	131.974319	DIRECT 2.1
884	HLJ_wheat_6	46.898256	131.981913	DIRECT 2.1
885	HLJ_wheat_8	46.791889	131.906693	DIRECT 2.1
886	HLJ_wheat_14	46.764097	131.742082	DIRECT 2.1
887	HLJ_wheat_15	46.758947	131.847292	DIRECT 2.1
888	HLJ_wheat_16	46.736583	131.714681	DIRECT 2.1
889	AH_wheat_1	33.151	116.772	DIRECT 2.1
890	AH_wheat_3	33.116	116.804	DIRECT 2.1
891	AH_wheat_5	33.1	116.865	DIRECT 2.1
892	AH_wheat_12	33.087	116.899	DIRECT 2.1
893	BART	44.0639	-71.2873	GBOV V3
894	BLAN	39.0603	-78.0716	GBOV V3
895	CPER	40.8155	-104.746	GBOV V3
896	DELA	32.54172	-87.80389	GBOV V3
897	DSNY	28.125	-81.4362	GBOV V3
898	GUAN	17.9695	-66.8687	GBOV V3
899	HAIN	51.0792	10.4522	GBOV V3
900	HARV	42.5378	-72.1715	GBOV V3
901	JERC	31.1948	-84.4686	GBOV V3
902	JORN	32.5907	-106.843	GBOV V3
903	KONA	39.110446	-96.612935	GBOV V3
904	LAJA	18.02125	-67.0769	GBOV V3
905	MOAB	38.2483	-109.388	GBOV V3
906	NIWO	40.0542	-105.582	GBOV V3
907	ONAQ	40.1776	-112.452	GBOV V3
908	ORNL	35.9641	-84.2826	GBOV V3
909	OSBS	29.6765	-82.0091	GBOV V3
910	SCBI	38.8929	-78.1395	GBOV V3
911	SERC	38.8901	-76.56	GBOV V3
912	SRER	31.91068	-110.83549	GBOV V3
913	STEI	45.5089	-89.5864	GBOV V3
914	STER	40.4619	-103.029	GBOV V3
915	TALL	32.9505	-87.3933	GBOV V3
916	TUMB	-35.65652	148.15163	GBOV V3
917	UNDE	46.2339	-89.5372	GBOV V3

918	VASN	39.570721	-1.2882201	GBOV V3
919	WOOD	47.1282	-99.2414	GBOV V3
920	AGOUFOU E-W	15.3393	-1.4841	AMMA
921	AGOUFOU N-S	15.3393	-1.4841	AMMA
922	TIMBADIOR E-W	15.3323	-1.5463	AMMA
923	TIMBADIOR N-S	15.3323	-1.5463	AMMA
924	HOMBORI HONDO E-W	15.3299	-1.698	AMMA
925	HOMBORI HONDO N-S	15.3224	-1.6983	AMMA
926	KELMA FOREST E-W	15.2189	-1.5657	AMMA
927	KELMA HERBS E-W	15.2189	-1.5657	AMMA
928	KELMA PLAIN E-W	15.2175	-1.5715	AMMA
929	TARA NE-SW	15.2301	-1.5833	AMMA
930	TARA NW-SE	15.2301	-1.5833	AMMA
931	EGUERIT E-W	15.5041	-1.3976	AMMA
932	BILANTAO NE-SW	15.2852	-1.5587	AMMA

(*) Processing failed for these sites because they are located at the edge of an input tile.

Annex B: Example of the global data attributes of the tiles

Attribute	Example
doi	10.5285/34e4bfe402c048c783e64eac0f0bca37
title	ESA CCI Vegetation Parameters LAI, fAPAR
institution	VITO
source	SPOT-VEGETATION and PROBA-V Top-of-Canopy reflectance and uncertainty intermediate data from C3S_312b_Lot5 contract. Description available in https://datastore.copernicus-climate.eu/documents/satellite-albedo/D1.3.4-v2.0_ATBD_CDR_SA_MULTI_SENSOR_v2.0_PRODUCTS_v1.1.pdf
history	2023-09-06 09:25:57 - Product generated by OptiSAIL r37088M\n2023-09-29 18:31:14 - Final product packaging by cciv_packager.py 1.0
references	ATBD: https://climate.esa.int/documents/1953/VP-CCI_D2.1_ATBD_V1.1.pdf
tracking_id	54067a98-108f-49ed-b8b2-a9d630e85a13
Conventions	CF-1.8
product_version	V1.0
format_version	CCI Data Standards v2.3
keywords	satellite, observation, vegetation, multi-sensor, multi-angular
id	ESACCI-VEGETATION-L3S-VP_PRODUCTS-MERGED-tile_X19Y05-20191117-fv1.0.nc
naming_authority	vegetation_parameters.esa-cci
keywords_vocabulary	science keywords
cdm_data_type	Grid
date_created	20230929T163113Z
creator_name	ESA Vegetation Parameters CCI
creator_url	https://climate.esa.int/en/projects/vegetation-parameters/
creator_email	remotesensing@vito.be
project	Climate Change Initiative - European Space Agency
geospatial_lat_min	15.00893
geospatial_lat_max	25
geospatial_lon_min	10
geospatial_lon_max	19.99107
geospatial_vertical_min	NA
geospatial_vertical_max	NA
time_coverage_start	20191117T000000Z
time_coverage_end	20191117T235959Z
standard_name_vocabulary	NetCDF Climate and Forecast (CF) Metadata Convention version 1.8
license	ESA CCI Data Policy: free and open access
platform	PROBA-V
sensor	Végétation-P
spatial_resolution	1km
key_variables, LAI	fAPAR
geospatial_lat_units	degree
geospatial_lat_resolution	-0.00893
geospatial_lon_units	degree
geospatial_lon_resolution	0.008929
processor_version	OptiSAIL-r37088M
mask_clouds_from_processing	on

processing_level	L3S
prior_names	N_struct Cab Car Anth Cbrown Cw Cm LIDFa_II LAI hspot soilEOF1 soilEOF2 moisture snowheight k_vol k_geo gamm_cloud
prior_median	array([1.30000000e+00, 6.00000000e+01, 1.25000000e+01, 1.27822382e+01, 3.19555955e-01, 2.50250000e-02, 1.05000000e-02, 4.50000000e+01, 1.00000000e+00, 2.00000000e-02, 3.33066907e-16, 5.55111512e-17, 1.00000000e-01, 1.29999998e-04, 5.00000000e-02, 5.00000000e-02, 1.00000000e+00])
prior_minimum	array([1.00000000e+00, 0.00000000e+00, 0.00000000e+00, 0.00000000e+00, 0.00000000e+00, 5.00000000e-05, 1.00000000e-03, 0.00000000e+00, 0.00000000e+00, 1.00000000e-03, 3.08383894e+00, -4.64333924e+00, 0.00000000e+00, 0.00000000e+00, 0.00000000e+00, 0.00000000e+00, 0.00000000e+00])
prior_maximum	array([5.00000000e+000, 1.00000000e+002, 2.50000000e+001, 4.00000000e+001, 1.00000000e+000, 5.00000000e-002, 2.00000000e-002, 9.00000000e+001, 8.00000000e+000, 1.00000000e+000, 2.26768835e+000, 8.28583829e+000, 1.00000000e+000, 1.80770722e+173, 5.00000000e-001, 5.00000000e-001, 1.00000000e+004])
prior_note	soilEOF1 and soilEOF2 prior extremes are given as the values corresponding to the internal rotated control parameter tuples (-inf,-inf), (inf,inf).
wavelengths_for_diagnostics_nm	array([400., 410., 420., 430., 440., 450., 460., 470., 480., 490., 500., 510., 520., 530., 540., 550., 560., 570., 580., 590., 600., 610., 620., 630., 640., 650., 660., 670., 680., 690., 700., 710., 720., 730., 740., 750., 760., 770., 780., 790., 800., 810., 820., 830., 840., 850., 860., 870., 880., 890., 900., 910., 920., 930., 940., 950., 960., 970., 980., 990., 1000., 1010., 1020., 1030., 1040., 1050., 1060., 1070., 1080., 1090., 1100., 1110., 1120., 1130., 1140., 1150., 1160., 1170., 1180., 1190., 1200., 1210., 1220., 1230., 1240., 1250., 1260., 1270., 1280., 1290., 1300., 1310., 1320., 1330., 1340., 1350., 1360., 1370., 1380., 1390., 1400., 1410., 1420., 1430., 1440., 1450., 1460., 1470., 1480., 1490., 1500., 1510., 1520., 1530., 1540., 1550., 1560., 1570., 1580., 1590., 1600., 1610., 1620., 1630., 1640., 1650., 1660., 1670., 1680., 1690., 1700., 1710., 1720., 1730., 1740., 1750., 1760., 1770., 1780., 1790., 1800., 1810., 1820., 1830., 1840., 1850., 1860., 1870., 1880., 1890., 1900., 1910., 1920., 1930., 1940., 1950., 1960., 1970., 1980., 1990., 2000., 2010., 2020., 2030., 2040., 2050., 2060., 2070., 2080., 2090., 2100., 2110., 2120., 2130., 2140., 2150., 2160., 2170., 2180., 2190., 2200., 2210., 2220., 2230., 2240., 2250., 2260., 2270., 2280., 2290., 2300., 2310., 2320., 2330., 2340., 2350., 2360., 2370., 2380., 2390., 2400., 2410., 2420., 2430., 2440., 2450., 2460., 2470., 2480., 2490., 2500.])
soil_mean_BHR_for_diagnostics	array([0.0695912, 0.0720368, 0.0750421, 0.0790781, 0.0839228, 0.0882468, 0.0913797, 0.0938661, 0.0967809, 0.10082 , 0.105909 , 0.111441 , 0.11728 , 0.123616 , 0.130748 , 0.138754 , 0.1475 , 0.156412 , 0.165185 , 0.172702 , 0.179304 , 0.184962 , 0.190144 , 0.195547 , 0.201123 , 0.206689 , 0.212137 , 0.217808 , 0.223476 , 0.229285 , 0.235092 , 0.240827 , 0.246588 , 0.252056 , 0.257279 , 0.262302 , 0.266856 , 0.27116 , 0.275111 , 0.27854 , 0.281697 , 0.284608 , 0.287139 , 0.28948 , 0.291834 , 0.294006 , 0.29609 , 0.298308 , 0.300621 , 0.302945 , 0.305301 , 0.307722 , 0.310391 , 0.313125 , 0.315799 , 0.31847 , 0.321202 , 0.324001 , 0.325484 , 0.328258 , 0.331077 , 0.334009 , 0.336944 , 0.339786 , 0.3425 , 0.345039 , 0.347605 , 0.35028 , 0.352955 , 0.355668 , 0.358307 , 0.360899 , 0.363584 , 0.366276 , 0.368841 , 0.371145 , 0.373257 , 0.375403 , 0.377537 , 0.37969 , 0.381895 , 0.384049 , 0.386084 , 0.387912 , 0.389621 , 0.39136 , 0.393046 , 0.39469 , 0.396157 , 0.397382 , 0.398485 , 0.399559 , 0.400707 , 0.401791 , 0.402832 , 0.403553 , 0.403844 , 0.4034 , 0.400021 , 0.394581 , 0.390148 , 0.383446 , 0.383041 , 0.390918 , 0.394628 , 0.396935 , 0.398664 , 0.400483 , 0.402826 , 0.405046 , 0.407067 , 0.409012 , 0.410779 , 0.41239 , 0.413798 , 0.415038 , 0.41628 , 0.417451 , 0.418563 , 0.419613 , 0.420647 , 0.421612 , 0.422518 , 0.423379 , 0.424209 , 0.424953 , 0.425636 , 0.426313 , 0.426873 , 0.427391 , 0.427902 , 0.428266 , 0.428399 , 0.42832 , 0.428263 , 0.428127 , 0.427961 , 0.427852 , 0.427845 , 0.427953 , 0.428354 , 0.426501 , 0.427433 , 0.42837 , 0.429018 , 0.429081 , 0.427789 , 0.42342 , 0.413205 , 0.395613 , 0.372225 , 0.357176 , 0.355355 , 0.358758 , 0.363358 , 0.368414 , 0.373807 , 0.379425 , 0.385294 , 0.391393 , 0.3974 , 0.40293 , 0.407842 , 0.412004 , 0.41531 , 0.418033 , 0.420439 , 0.422564 , 0.424444 , 0.42611 , 0.427737 , 0.429238 , 0.431494 , 0.432537 , 0.429943 , 0.422648 , 0.41389 , 0.406736 , 0.400636 ,

	0.394152 , 0.384206 , 0.382494 , 0.397568 , 0.402505 , 0.402145 , 0.401616 , 0.401043 , 0.400053 , 0.398639 , 0.396454 , 0.393955 , 0.39133 , 0.390242 , 0.389343 , 0.387481 , 0.384384 , 0.383275 , 0.381686 , 0.37813 , 0.37676 , 0.376509 , 0.374182 , 0.369683 , 0.363753 , 0.357603 , 0.352992 , 0.349255 , 0.346231 , 0.343957 , 0.342916 , 0.344225])
soilEOF1_BHR_for_diagnostics	array([0.0173284, 0.0182677, 0.0193056, 0.0206864, 0.0223534, 0.0238039, 0.0248162, 0.0256205, 0.0265665, 0.0278568, 0.0294692, 0.0312142, 0.0330294, 0.0349412, 0.0369933, 0.0391496, 0.0413383, 0.0433858, 0.0452162, 0.0466615, 0.0478673, 0.0488909, 0.0498571, 0.0508988, 0.0520189, 0.0531232, 0.0541774, 0.0552415, 0.056264 , 0.0572755, 0.0582617, 0.0592328, 0.0601976, 0.0611315, 0.0620254, 0.0628773, 0.0636642, 0.0643861, 0.0650318, 0.0655936, 0.0660846, 0.0664996, 0.0668377, 0.0671091, 0.0673343, 0.0675032, 0.0676554, 0.067808 , 0.067963 , 0.0681259, 0.0683117, 0.0684929, 0.0686999, 0.068921 , 0.0691335, 0.0693102, 0.0694915, 0.069666 , 0.0695139, 0.0697352, 0.069955 , 0.0701967, 0.0704259, 0.0706506, 0.0708705, 0.0710822, 0.0713135, 0.0715586, 0.0718186, 0.0720906, 0.0723708, 0.0726678, 0.0729896, 0.0733135, 0.0736189, 0.073898 , 0.074157 , 0.0744346, 0.0747206, 0.0750171, 0.0753092, 0.0755905, 0.0758448, 0.0760661, 0.0762671, 0.0764977, 0.076731 , 0.0769432, 0.0771086, 0.0772039, 0.0772669, 0.0773366, 0.0774304, 0.0775158, 0.0776034, 0.0775932, 0.0774624, 0.0772671, 0.0763164, 0.0747198, 0.0735763, 0.072182 , 0.0723483, 0.0748601, 0.0758249, 0.076294 , 0.0765662, 0.0767621, 0.077023 , 0.0772837, 0.0775143, 0.0777448, 0.077946 , 0.078108 , 0.0782448, 0.0783614, 0.0784606, 0.0785497, 0.0786426, 0.0787262, 0.0788064, 0.0788751, 0.0789309, 0.0789831, 0.0790258, 0.0790611, 0.0790987, 0.0791194, 0.0791067, 0.0790926, 0.0790849, 0.0790551, 0.0789949, 0.0788957, 0.0787992, 0.0786921, 0.0785862, 0.0784853, 0.0783924, 0.0783096, 0.0782748, 0.0779626, 0.0780388, 0.0781113, 0.0781254, 0.078108 , 0.0779213, 0.0772834, 0.0758195, 0.0733052, 0.0697721, 0.0674757, 0.067392 , 0.0681109, 0.0689018, 0.0696157, 0.0703138, 0.0710232, 0.0717502, 0.0725187, 0.0732628, 0.0739763, 0.0745915, 0.0750915, 0.0754595, 0.0757117, 0.0759069, 0.0760243, 0.07608 , 0.0760889, 0.0760897, 0.0760357, 0.0761993, 0.0761659, 0.0753602, 0.0734983, 0.0716291, 0.0704317, 0.0693051, 0.0677406, 0.0653992, 0.064542 , 0.0681636, 0.0696139, 0.069863 , 0.0701644, 0.0703036, 0.0701876, 0.0696147, 0.0689529, 0.0683383, 0.0676633, 0.0672092, 0.0668853, 0.0665649, 0.0662077, 0.0662945, 0.0662744, 0.0657415, 0.0656772, 0.0658934, 0.0656297, 0.0649405, 0.0640318, 0.0629573, 0.0624521, 0.0620676, 0.0618959, 0.0617114, 0.0614646, 0.0619486])
soilEOF2_BHR_for_diagnostics	array([0.0217154 , 0.0230395 , 0.0248718 , 0.0273551 , 0.0303726 , 0.0329465 , 0.0344604 , 0.0354672 , 0.036766 , 0.0388662 , 0.0417356 , 0.0449054 , 0.0482261 , 0.0517399 , 0.0554837 , 0.0594328 , 0.0635563 , 0.0675561 , 0.0711615 , 0.0739075 , 0.0759726 , 0.0773863 , 0.0783401 , 0.0791222 , 0.0798875 , 0.0805017 , 0.0809605 , 0.0813537 , 0.0816219 , 0.0817896 , 0.0818486 , 0.0818148 , 0.081693 , 0.0814155 , 0.0809388 , 0.080228 , 0.0792431 , 0.0779782 , 0.0764168 , 0.0745835 , 0.0724957 , 0.0701972 , 0.0676986 , 0.0650671 , 0.0623432 , 0.0595599 , 0.0567719 , 0.0540107 , 0.0512718 , 0.0486013 , 0.045999 , 0.0434427 , 0.0409652 , 0.0385153 , 0.0361159 , 0.033726 , 0.0313409 , 0.0289896 , 0.0237412 , 0.0216026 , 0.0193365 , 0.0170363 , 0.0147311 , 0.0124168 , 0.010105 , 0.00785024, 0.00562315, 0.00340325, 0.00120341, -0.00098264, -0.00314313, -0.00524616, -0.00734828, -0.00943355, -0.011492 , -0.013539 , -0.0155219 , -0.0174805 , -0.0193888 , -0.0212712 , -0.0231376 , -0.0249527 , -0.0267764 , -0.0285753 , -0.0303454 , -0.0321025 , -0.0338201 , -0.0355211 , -0.0371784 , -0.0387948 , -0.0403619 , -0.0418759 , -0.0433801 , -0.0448142 , -0.0462171 , -0.0475374 , -0.0487712 , -0.0498364 , -0.0502923 , -0.0506463 , -0.051348 , -0.0510928 , -0.0514935 , -0.0530801 , -0.054222 , -0.0553326 , -0.0564009 , -0.0574775 , -0.0586936 , -0.0599473 , -0.061222 , -0.0625184 , -0.0637907 , -0.0649716 , -0.0661137 , -0.0671886 , -0.0682462 , -0.0692447 , -0.0702318 , -0.0712048 , -0.0721469 , -0.0730342 , -0.0738822 , -0.0746755 , -0.0754047 , -0.0760421 , -0.0766052 , -0.0772174 , -0.0778399 , -0.0784269 , -0.0789815 , -0.0794324 , -0.0797616 , -0.0800756 , -0.0805879 , -0.081074 , -0.0814589 , -0.0818648 , -0.0822988 , -0.0826988 , -0.0831884 , -0.0838321 , -0.084469 , -0.0851071 , -0.0856348 , -0.0859829 , -0.0857986 , -0.0845351 , -0.0811936 , -0.0749661 , -0.066817 , -0.0611679 , -0.0589496 , -0.0586385 , -0.0595424 , -0.0612597 , -0.0633694 , -0.0655539 , -0.0678221 , -

	0.0701127 , -0.0723 , -0.074149 , -0.0756684 , -0.0768337 , -0.077655 , -0.078382 , -0.0790751 , -0.0797738 , -0.0803859 , -0.0808792 , -0.0813582 , -0.0816698 , -0.0820967 , -0.0820209 , -0.0808705 , -0.0784419 , -0.0756547 , -0.0734578 , -0.0722053 , -0.0718974 , -0.069883 , -0.0703798 , -0.0761024 , -0.077557 , -0.0772484 , -0.0769284 , -0.0761227 , -0.0752116 , -0.0742951 , -0.073451 , -0.0724285 , -0.0717504 , -0.072088 , -0.0722298 , -0.0716557 , -0.0701978 , -0.0693353 , -0.0681903 , -0.0663668 , -0.0655848 , -0.0654388 , -0.0647336 , -0.0633816 , -0.061434 , -0.0592988 , -0.057794 , -0.0564847 , -0.0551061 , -0.0546734 , -0.0540007 , -0.0547994])
wavelengths_for_inversion_nm	array([463.5, 655. , 839. , 1602.5])
soil_mean_BHR_for_inversion	array([0.09224994, 0.209413 , 0.2915986 , 0.42088825])
soilEOF1_BHR_for_inversion	array([0.02509771, 0.0536503 , 0.06731178, 0.07882358])
soilEOF2_BHR_for_inversion	array([0.03481278, 0.0807311 , 0.06261559, -0.07236872])
summary	This dataset contains L3S 5-daily ECV Vegetation Parameters products: Leaf Area Index (LAI) and fraction of Absorbed Photosynthetically active Radiation (fAPAR). LAI is effective LAI. L3S data are observations combined from multiple instruments into a common spatiotemporal grid.
comment	tile number = X19Y05, PROBA-V tiling grid https://proba-v.vgt.vito.be/sites/probavvgt/files/downloads/PROBA-V_C2_Products_User_Manual.pdf
time_coverage_duration	P1D
time_coverage_resolution	P5D