ISO 19131 SMAPVEX16-MB Crop LAI Dataset – Data Product Specifications

Revision: A

Data product specifications: SMAPVEX16-MB Crop LAI Dataset

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Data product specifications: SMAPVEX16-MB Crop LAI Dataset / Spécifications de contenu informationnel

1. Overview

1.1. Informal description

The Soil Moisture Active/Passive Validation Experiment 2016-Manitoba (SMAPVEX16-MB) was conducted in the Carman/Elm Creek region. The purpose of the experiment was to collect a variety of ground measurements with coincident remotely-sensed data to calibrate and increase the accuracy of the National Aeronautics and Space Administration (NASA)'s Soil Moisture Active/Passive (SMAP) soil moisture products.

This dataset contains leaf area index (LAI) data that was collected for the SMAPVEX16-MB experiment. LAI was measured with hemispherical digital photos. In this technique, a camera with a fish eye lens captured photos of the crop canopy with the camera positioned at least 50 cm above or below the canopy. The camera was mounted on a pole if the picture was taken above the canopy. Seven photos were taken along two transects (14 photos in total) at three sampling sites for each of the fields. Crews were instructed to take one photo then move approximately 5 meters to take the next photos. Field crews positioned themselves relative to the sun to minimize shadowing in the photos. These photos were post-processed to estimate LAI using the CanEye software. All 14 photos were averaged to provide one estimate of LAI per sample site.

Prior to the use of CanEye, the photos were enhanced to increase the quality through the use of ViewNX-2 (Nikon) software. Once enhancements were implemented, the images were then imported in the CanEye software for classification and LAI calculation. The parameters of the software were configured in accordance to the photos, i.e. number of lines and columns, julian date and latitude. Masking for any non-soil or data acquisition anomalies were applied where necessary in addition to any removal of photos that were problematic. Finally, the photos were carefully classified into vegetation and soil in order to compute the LAI.

1.2. Data product specification - metadata

This section provides metadata about the creation of this data product specification

Data product specification – title:	SMAPVEX16-MB Crop LAI Dataset
Data product specification - reference date:	June 13 – July 21, 2016
Data product specification - responsible party:	AAFC STB
Data product specification – language:	English
Data product specification - topic category:	geoscientificInformation

1.3. Terms and definitions

- Feature attribute

characteristic of a feature

- Class
  description of a set of objects that share the same attributes, operations, methods, relationships, and semantics [UML Semantics]
  NOTE: A class does not always have an associated geometry (e.g. the metadata class).

- Feature
  abstraction of real world phenomena

- Object
  entity with a well-defined boundary and identity that encapsulates state and behaviour [UML Semantics]
  NOTE: An object is an instance of a class.

- Package
  grouping of a set of classes, relationships, and even other packages with a view to organizing the model into more abstract structures

1.4. Abbreviations

AAFC	Agriculture and Agri-Food Canada
GPS	Global Positioning System
LAI	Leaf Area Index
NASA	National Aeronautics and Space Administration
SMAP	Soil Moisture Active/Passive
SMAPVEX16-MB	Soil Moisture Active/Passive Validation Experiment 2016-Manitoba
STB	Science and Technology Branch

2. SPECIFICATION SCOPE

This data specification has only one scope, the general scope.

NOTE: The term ‘specification scope’ originates from the International Standard ISO19131. ‘Specification scope’ does not express the purpose for the creation of a data specification or the potential use of data, but identifies partitions of the data specification where specific requirements apply.

3. DATA PRODUCT IDENTIFICATION

3.1. Data series identification

Title	SMAPVEX16-MB Crop LAI Dataset
Alternate Title	SMAPVEX16-MB Crop LAI Data
Abstract	SMAPVEX16-MB was conducted to assess and increase the overall accuracy of the soil moisture retrievals produced using the SMAP satellite. Crop LAI measurements were taken to address the influence of the crop canopy on the calculation of the soil moisture value.
Purpose	This dataset is used to assess and increase the overall accuracy of the SMAP soil moisture product.
Topic Category	geoscientificInformation
Spatial Representation Type	textTable
Spatial Resolution	
Geographic Description	Carman/Elm Creek, Manitoba, Canada
Supplemental Information	Principle Investigators: Heather McNairn - Agriculture and Agri-Food Canada; Tom Jackson - United States Department of Agriculture; Co-Investigators(Canada): Amine Merzouki, Anna Pacheco, Jarrett Powers - Agriculture and Agri-Food Canada; Stephane Belair, Peter Toose - Environment and Climate Change Canada; Monique Bernier - Institut National de la Recherche Scientifique(INRS); Aaron Berg, Tracy Rowlandson - University of Guelph; Paul Bullock - University of Manitoba; RoTimi Ojo - Manitoba Agriculture; Alexandre Roy - University of Montreal;

	Ramata Magagi - University of Sherbrooke; Co-Investigators(United States): Alicia Joseph, Peggy O'Neill - NASA Goddard Space Flight Centre; Andreas Colliander, Sab Kim - NASA Jet Propulsion Lab; Mike Cosh - United States Department of Agriculture; Co-Investigators(International): Giuseppe Satalino - National Research Council of Italy (ISSIA-CNR)
Constraints	SMAPVEX16-MB field data will be placed on the University of Sherbrooke website. Access will be limited by password that will be provided to principle and co-investigators listed below. Principle and Co-Investigators are to ensure that staff, graduate students and post docs respect the terms of the agreement on usage and distribution. Access to the website will be restricted until August 1, 2017 for preliminary research and quality control. After August 1, 2017 all field data will be transferred to the National Snow and Ice Data Centre to be made publically available.
Keywords	SMAPVEX16-MB, leaf area index, LAI, vegetation, biomass
Scope identification	series

3.2. Data product identification

3.2.1. SMAPVEX16-MB Crop LAI Dataset

Title	SMAPVEX16-MB Crop LAI Dataset
Alternate Title	SMAPVEX16-MB Crop LAI Data
Abstract	This dataset contains LAI data that was collected

	for the SMAPVEX16-MB experiment.
Purpose	SMAP produces global soil moisture products. This dataset is used to assess and increase the overall accuracy of the SMAP soil moisture product.
Topic Category	geoscientificInformation
Spatial Representation Type	textTable
Spatial Resolution	
Geographic Description	Carman/Elm Creek, Manitoba, Canada
Supplemental Information	Principle Investigators: Heather McNairn - Agriculture and Agri-Food Canada; Tom Jackson - United States Department of Agriculture; Co-Investigators(Canada): Amine Merzouki, Anna Pacheco, Jarrett Powers - Agriculture and Agri-Food Canada; Stephane Belair, Peter Toose - Environment and Climate Change Canada; Monique Bernier - Institut National de la Recherche Scientifique(INRS); Aaron Berg, Tracy Rowlandson - University of Guelph; Paul Bullock - University of Manitoba; RoTimi Ojo - Manitoba Agriculture; Alexandre Roy - University of Montreal; Ramata Magagi - University of Sherbrooke; Co-Investigators(United States): Alicia Joseph, Peggy O'Neill - NASA Goddard Space Flight Centre; Andreas Colliander, Sab Kim - NASA Jet Propulsion Lab; Mike Cosh - United States Department of Agriculture; Co-Investigators(International): Giuseppe Satalino - National Research Council of Italy (ISSIA-CNR)
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Keywords	SMAPVEX16-MB, leaf area index, LAI, vegetation, biomass
Scope Identification	dataset
Feature Attribute Names	SITE_ID, DATE, CROP, TEAM_ID, CAM_ORIENT, SAMPLE_ORIENT, PHOTO_NUM, FCOVER_MEAN, FCOVER_STD, PAI_TRUE, EFF_PAI, EFF_PAI_MILLER, QC, QC_FLAG, COMMENTS

4. DATA CONTENT AND STRUCTURE

4.1. Feature-based application schema

N/A

4.2. Feature catalogue – SMAPVEX16-MB Crop LAI Dataset

Title	SMAPVEX16-MB Crop LAI Feature Catalogue
Scope	series
Version Number	1
Version Date	March 28, 2017
Producer	AAFC

System-generated attributes (for example, OBJECTID, Shape, Shape Length and Area) are not defined in the feature catalog.

4.2.1. Feature attributes

4.2.1.1. SITE_ID

Name	Site Identification (SITE_ID)		
Definition	Unique ID to identify the site where sampling occurs. Each field has 16 sampling locations.		
Aliases	SITE_ID		
Producer	AAFC		
Value Data Type	String		
Value Domain Type	0 (not enumerated)		
Value Domain			
	Feature Attribute Value		
	Label	Code	Definition

4.2.1.2. DATE

Name	Date (DATE)		
Definition	Date of photo (YY-MM-DD).		
Aliases	DATE		
Producer	AAFC		
Value Data Type	Date		
Value Domain Type	0 (not enumerated)		
Value Domain			
	Feature Attribute Value		
	Label	Code	Definition

4.2.1.3. CROP

Name	Crop (CROP)
Definition	Crop that was grown in 2016.

Aliases	CROP		
Producer	AAFC		
Value Data Type	String		
Value Domain Type	0 (not enumerated)		
Value Domain			
	Feature Attribute Value		
	Label	Code	Definition

4.2.1.4. TEAM_ID

Name	Team Identification (TEAM_ID)		
Definition	Team ID number.		
Aliases	TEAM_ID		
Producer	AAFC		
Value Data Type	String		
Value Domain Type	0 (not enumerated)		
Value Domain			
	Feature Attribute Value		
	Label	Code	Definition

4.2.1.5. CAM_ORIENT

Name	Camera Orientation (CAM_ORIENT)		
Definition	The orientation of the camera within the crop during the data collection, i.e. downward (above the canopy) or upward (below the canopy).		
Aliases	CAM_ORIENT		
Producer	AAFC		
Value Data Type	String		
Value Domain Type	0 (not enumerated)		
Value Domain			
	Feature Attribute Value		
	Label	Code	Definition

4.2.1.6. SAMPLE_ORIENT

Name	Sampling Orientation (SAMPLE_ORIENT)
Definition	The orientation of the hemispherical camera in regards to the crop row orientation, i.e. perpendicular, parallel, or diagonal to the crop rows.
Aliases	SAMPLE_ORIENT
Producer	AAFC

Value Data Type	String		
Value Domain Type	0 (not enumerated)		
Value Domain			
	Feature Attribute Value		
	Label	Code	Definition

4.2.1.7. PHOTO_NUM

Name	Photograph Number (PHOTO_NUM)		
Definition	Number of photos at the site.		
Aliases	PHOTO_NUM		
Producer	AAFC		
Value Data Type	Integer		
Value Domain Type	0 (not enumerated)		
Value Domain			
	Feature Attribute Value		
	Label	Code	Definition

4.2.1.8. FCOVER_MEAN

Name	Fraction Cover Mean (FCOVER_MEAN)		
Definition	Fraction of the soil/sky covered by the vegetation viewed in the nadir direction. The mean value is calculated from all the processed photos for each site.		
Aliases	FCOVER_MEAN		
Producer	AAFC		
Value Data Type	Double		
Value Domain Type	0 (not enumerated)		
Value Domain			
	Feature Attribute Value		
	Label	Code	Definition

4.2.1.9. FCOVER_STD

Name	Fraction Cover Standard Deviation (FCOVER_STD)
Definition	The standard deviation of calculated FCOVER values.
Aliases	FCOVER_STD
Producer	AAFC
Value Data Type	Double
Value Domain Type	0 (not enumerated)

Value Domain			
	Feature Attribute Value		
	Label	Code	Definition

4.2.1.10. PAI_TRUE

Name	Plant Area Index (PAI_TRUE)		
Definition	Plant Area Index (PAI) is an estimation of LAI calculated by CanEye Version 5.1 software from Digital Hemispheric Photos (DHP).		
Aliases	PAI_TRUE		
Producer	AAFC		
Value Data Type	Double		
Value Domain Type	0 (not enumerated)		
Value Domain			
	Feature Attribute Value		
	Label	Code	Definition

4.2.1.11. EFF_PAI

Name	Modeled PAI (EFF_PAI)		
Definition	The PAI based on the modeling in the CanEye Version 5.1 software.		
Aliases	EFF_PAI		
Producer	AAFC		
Value Data Type	Double		
Value Domain Type	0 (not enumerated)		
Value Domain			
	Feature Attribute Value		
	Label	Code	Definition

4.2.1.12. EFF_PAI_MILLER

Name	Miller Modeled PAI (EFF_PAI_MILLER)
Definition	The derived PAI from the gap fraction measured in all directions using the formula of Miller (1967). This model assumes that gap fraction depends only on the view zenith angle.
Aliases	EFF_PAI_MILLER
Producer	AAFC
Value Data Type	Double
Value Domain Type	0 (not enumerated)
Value Domain	

	Feature Attribute Value		
	Label	Code	Definition

4.2.1.13. QC

Name	Quality Control (QC)		
Definition	A manual control procedure was applied on the data, where 1 indicates “Great quality” and 2 indicates “Use with caution”.		
Aliases	QC		
Producer	AAFC		
Value Data Type	Integer		
Value Domain Type	1 (enumerated)		
Value Domain			
	Feature Attribute Value		
	Label	Code	Definition
	Great quality	1	Data is of great quality.
	Use with caution	2	Data should be used with caution.

4.2.1.14. QC_FLAG

Name	Quality Control Flag (QC_FLAG)		
Definition	Rationale for assigning a poorer quality control class. Data can be used for analysis but these flags can aid in interpreting potential errors realted to the LAI.		
Aliases	QC_FLAG		
Producer	AAFC		
Value Data Type	String		
Value Domain Type	0 (not enumerated)		
Value Domain			
	Feature Attribute Value		
	Label	Code	Definition

4.2.1.15. COMMENTS

Name	Comments (COMMENTS)
Definition	Comments regarding any issue observed in the field processing.
Aliases	COMMENTS
Producer	AAFC
Value Data Type	String
Value Domain Type	0 (not enumerated)

Value Domain			
	Feature Attribute Value		
	Label	Code	Definition

5. REFERENCE SYSTEMS

5.1. Spatial reference system

Not applicable.

5.2. Temporal reference system

Gregorian calendar

6. DATA QUALITY

6.1. Completeness

Measure not used at this time.

6.2. Logical consistency

Measure not used at this time.

6.3. Positional accuracy

The location of the crop LAI photograph has been recorded with a handheld Garmin Global Positioning System (GPS) device. The device is accurate to within approximately 3m.

6.4. Temporal accuracy

Measure not used at this time.

6.5. Thematic accuracy

Measure not used at this time.

6.6. Lineage statement

Lineage Statement	The date each crop LAI photo was taken has been recorded within the DATE field of the dataset.
Scope	

7. DATA CAPTURE

Crop LAI data was manually quality controlled and a quality control flag was attached to the record. Data was either given a 1 indicating the record is of great quality, or 2 indicating the record should be used with caution.

8. DATA MAINTENANCE

Unknown.

9. PORTRAYAL

Not applicable.

10. DATA PRODUCT DELIVERY

Csv
Format name: Comma Delimited
Format version: 1.0
Specification: A delimited data format that has fields/columns separated by the comma character.
Languages: eng
Character set: utf8

11. METADATA

Not applicable.