ISO 19131 SMAPVEX16-MB Temporary Soil Moisture Station Dataset – Data Product Specifications

Revision: A

Data product specifications: SMAPVEX16-MB Temporary Soil Moisture Station Dataset
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Data product specifications: SMAPVEX16-MB Temporary Soil Moisture Station 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.

Soil moisture, temperature and precipitation data was collected by the temporary soil stations for SMAPVEX16-MB. Temporary soil moisture stations were placed on 50 agricultural fields within the study area. Stations were installed at Site 1 in May before the start of the campaign and were removed in July-August following the end of the campaign. Each station consisted of 2 Stevens Hydra-probes: 1 installed horizontally at the 5cm depth (Hydra1) and the other installed vertically at the surface (Hydra2). The probes recorded hourly soil real dielectric constant (RDC) and soil temperature values throughout the campaign. 15 stations were also equipped with Hydrologic Services tipping buckets to record precipitation.

Volumetric water content (VWC) was derived from the RDC values using site specific calibration equations that were developed during the campaign. At Site 1, a core of known volume was inserted at the soil surface (top 5cm) and 3 Stevens Hydra-probe Poke and Go (POGO) measurements were collected in the area adjacent to the core. Cores were extracted, sealed and delivered to the University of Manitoba - Soil Science Department lab where wet weights were recorded, samples were oven-dried and dry weights recorded. A VWC was calculated and plotted against the averaged RDC values that were taken by the POGO for that date. An equation was developed using a line of best fit for each site. The calibration equation was applied to the corresponding station RDC values to produce a VWC value. A total of 15 sampling dates were used to produce the calibration equations.

1.2.　　Data product specification - metadata

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

Data product specification – title:	SMAPVEX16-MB Temporary Soil Moisture Station Dataset
Data product specification - reference date:	May 17, 2016 to August 17, 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
POGO	Poke and Go
RDC	Real Dielectric Constant
SMAP	Soil Moisture Active/Passive
SMAPVEX16-MB	Soil Moisture Active/Passive Validation Experiment 2016-Manitoba
STB	Science and Technology Branch
VWC	Volumetric Water Content

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 Temporary Soil Moisture Station Dataset
Alternate Title	SMAPVEX16-MB Temporary Station Data
Abstract	SMAPVEX16-MB was conducted to assess and increase the overall accuracy of the soil moisture retrievals produced using the SMAP satellite. Using temporary station data and comparing the results to those of the SMAP satellite's soil moisture products provides the ability to calculate the error between the observed and expected values.
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, soil moisture, Hydra-probe, real dielectric constant, volumetric water content, soil temperature, precipitation
Scope identification	series

3.2. Data product identification

3.2.1. SMAPVEX16-MB Temporary Soil Station Dataset

Title	SMAPVEX16-MB Temporary Soil Moisture Station Dataset
Alternate Title	SMAPVEX16-MB Temporary Soil Moisture Station Data
Abstract	Soil moisture, temperature and precipitation data were collected by the temporary soil moisture stations for the SMAPVEX16-MB campaign. Each station consisted of 2 Stevens Hydra-probes: 1 installed horizontally at the 5cm depth (Hydra1) and the other installed vertically at the surface (Hydra2). The probes recorded hourly soil RDC and soil temperature values throughout the campaign. 15 stations were also equipped with Hydrologic Services tipping buckets to record precipitation. VWC was derived from the RDC values using site specific calibrations equations that were developed during the campaign.
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):

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Keywords	SMAPVEX16-MB, soil moisture, Hydra-probe, real dielectric constant, volumetric water content, soil temperature, precipitation
Scope Identification	dataset
Feature Attribute Names	OBJECTID, SITE_ID, TIMESTAMP, PRECIP1, HYDRA1_RDC1, HYDRA1_SM1, HYDRA1_TEMP1, HYDRA2_RDC1, HYDRA2_SM1, HYDRA2_TEMP1

4. DATA CONTENT AND STRUCTURE

4.1.   Feature-based application schema

N/A

4.2.   Feature catalogue – SMAPVEX16-MB Temporary Soil Moisture Station Dataset

Title	SMAPVEX16-MB Temporary Soil Moisture Station Feature Catalogue
Scope	series
Version Number	1
Version Date	November 30, 2016
Producer	AAFC STB

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 that identifies the site where the station was installed.		
Aliases	SITE_ID		
Producer	AAFC STB		
Value Data Type	String		
Value Domain Type	0 (not enumerated)		
Value Domain			
	Feature Attribute Value		
	Label	Code	Definition

4.2.1.2.   TIMESTAMP

Name	Record timestamp (TIMESTAMP)		
Definition	Time of sampling in Central Daylight Savings Time (YYYY-MM-DD HH:MM).		
Aliases	TIMESTAMP		
Producer	AAFC STB		
Value Data Type	Date and time		
Value Domain Type	0 (not enumerated)		
Value Domain			
	Feature Attribute Value		
	Label	Code	Definition

4.2.1.3.   PRECIP1

Name	Precipitation (PRECIP)

Definition	Hourly precipitation totals (mm).		
Aliases	PRECIP1		
Producer	AAFC STB		
Value Data Type	Double		
Value Domain Type	0 (not enumerated)		
Value Domain			
	Feature Attribute Value		
	Label	Code	Definition

4.2.1.4.   HYDRA1_RDC

Name	1st Hydra-probe RDC measurement (HYDRA1_RDC)		
Definition	RDC value at the 5cm depth measured by Stevens Hydra-probe.		
Aliases	HYDRA1_RDC1		
Producer	AAFC STB		
Value Data Type	Double		
Value Domain Type	0 (not enumerated)		
Value Domain			
	Feature Attribute Value		
	Label	Code	Definition

4.2.1.5.   HYDRA1_SM

Name	1st Hydra-probe soil moisture measurement (HYDRA1_SM)		
Definition	Calibrated volumetric soil moisture value (cm3/cm3) at 5cm depth measured by Stevens Hydra-probe.		
Aliases	HYDRA1_SM1		
Producer	AAFC STB		
Value Data Type	Double		
Value Domain Type	0 (not enumerated)		
Value Domain			
	Feature Attribute Value		
	Label	Code	Definition

4.2.1.6.   HYDRA1_TEMP

Name	1st Hydra-probe temperature measurement (HYDRA1_TEMP)
Definition	Soil temperature (°C) at 5cm measured by Stevens Hydra-probe.
Aliases	HYDRA1_TEMP1
Producer	AAFC STB

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

4.2.1.7.   HYDRA2_RDC

Name	2nd Hydra-probe RDC measurement (HDYRA2_RDC)		
Definition	RDC value at the 0-5cm depth measured by Stevens Hydra-probe.		
Aliases	HYDRA2_RDC1		
Producer	AAFC STB		
Value Data Type	Double		
Value Domain Type	0 (not enumerated)		
Value Domain			
	Feature Attribute Value		
	Label	Code	Definition

4.2.1.8.   HYDRA2_SM

Name	2nd Hydra-probe soil moisture measurement (HYDRA2_SM)		
Definition	Calibrated volumetric soil moisture value (cm3/cm3) at 0-5cm depth measured by Stevens Hydra-probe.		
Aliases	HYDRA2_SM1		
Producer	AAFC STB		
Value Data Type	Double		
Value Domain Type	0 (not enumerated)		
Value Domain			
	Feature Attribute Value		
	Label	Code	Definition

4.2.1.9.   HYRDA2_TEMP

Name	2nd Hydra-probe temperature measurement (HYDRA2_TEMP)	
Definition	Soil temperature (°C) at 0-5cm measured by Stevens Hydra-probe.	
Aliases	HYDRA2_TEMP1	
Producer	AAFC STB	
Value Data Type	Double	
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 each temporary soil moisture station was recorded using a handheld Garmin Global Positioning System (GPS). The accuracy of the device is 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	Soil moisture, temperature and precipitation data was collected by the temporary soil stations for the SMAPVEX16-MB campaign. Stations were installed at Site 1 in May before the start of the campaign and were removed in July-August following the end of the campaign. All data recorded by the temporary soil moisture stations was between the months of May and August, 2016.
Scope	

7. DATA CAPTURE

Each temporary soil moisture station consisted of 2 Stevens Hydra-probes: 1 installed horizontally at the 5cm depth (Hydra1) and the other installed vertically at the surface (Hydra2). The probes recorded hourly soil RDC and soil temperature values throughout the campaign. 15 stations were also equipped with Hydrologic

Services tipping buckets to record precipitation.

VWC was derived from the RDC values using site specific calibration equations that were developed during the campaign. At Site 1, a core of known volume was inserted at the soil surface (top 5cm) and 3 Stevens Hydra-probe POGO measurements were collected in the area adjacent to the core. Cores were extracted, sealed and delivered to the University of Manitoba - Soil Science Department lab where wet weights were recorded, samples were oven-dried and dry weights recorded. A VWC was calculated and plotted against the averaged RDC values that were taken by the POGO for that date. An equation was developed using a line of best fit for each site. The calibration equation was applied to the corresponding station RDC values to produce a VWC value. A total of 15 sampling dates were used to produce the calibration equations.

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.