- Feed the G-reqs: in-situ requirements from the GWP activities

G-reqs: Geospatial in-situ requirements

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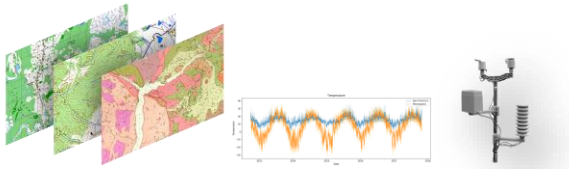
- **What: G-reqs** is an **open** database tool designed to gather the requirements **for in situ data** from **GEO activities** looking to cover **different needs** and know
  - how far requirements are met,
  - if the dataset exists, exist partially, there are barriers to their seamless use or need to be created,

- **Why:** In order to
  - In the short term:
    - know about the in-situ needs in GEO
    - **Collect** requirements from **GEO activities**
  - In the long term: **Analyze**, extract **reports**, detect **gaps** and **barriers**, issue **recommendations**
    - E.g. find evidence for a need of a new dataset specified through one of more requirements

- **How:** Based on user needs instead of producer specifications

From Needs to Requirements



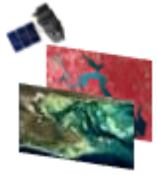
Requirements for in-situu data

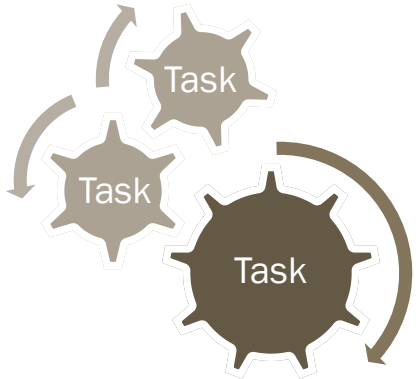
A **Requirement** is a concrete technical description of the properties of a potential in-situ dataset that will fulfil the Need.

GWP

Need is a problem or issue that can be addressed by using in-situ data.

Needs





A **Product** is the output to be created by using in-situ data. It can be a RS corrected image, a model result, a report, etc.

Products

User Requirements

- User Requirements are expressed with a small set of metadata properties, indicating:

1. Topic

2. Area

3. Quality

4. Time

5. Barriers

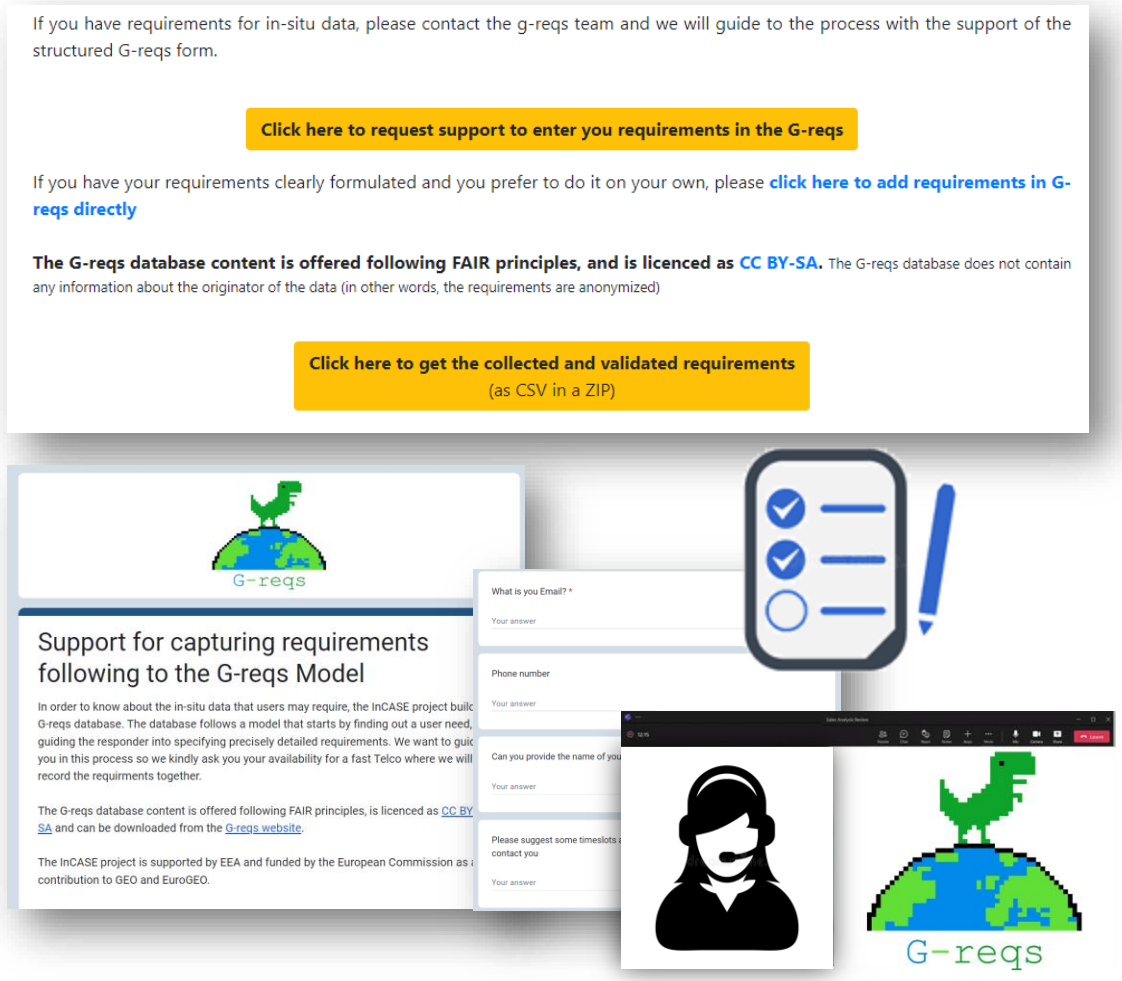
class G-reqs database UserReq

		UserRequirement
-	+	Name :String
-	+	Description :String [0..1]
1	+	VariableClass :VariableClassCode [0..*]
1	+	EssentialVariable :EssentialVariable [0..1]
1	+	Variable :String [0..1]
3	+	ThematicUncertainty :Number [0..2]
3	+	UoM :String [0..1]
4	+	UpdateFrequency :Number [0..2]
4	+	UpdateFrequencyUoM :TemporalUoMCode [0..1]
4	+	Timeliness :Number [0..2]
4	+	TimelinessUoM :TemporalUoMCode [0..1]
3	+	EvenDistribution :Boolean [0..1]
3	+	CoordinatedMeasure :String [0..1]
3	+	RepresentativityRadius :Number [0..2]
3	+	RepresentativityRadiousUoM :DistanceUoMCode [0..1]
2	+	HorizontalResolution :Number [0..2]
2	+	HorizontalResolutionUoM :DistanceUoMCode [0..1]
2	+	Vertical Resolucion :Number [0..2]
2	+	VerticalResolutionUoM :DistanceUoMCode [0..1]
5	+	DataAccess :DataAccessCode [0..1]

Detailed view of the UserRequirements class as in the G-reqs UML model.

Status: https://www.g-reqs.grumets.cat/

- G-reqs supports the translation of user needs into requirements via an App that acts as a user interface
- Some GEO activities have already filled the G-reqs and/or expressed interest to apply G-reqs in different areas: GEOGLAM, GFOI, GEO Blue Planet, GEO AquaWatch
- We will be conducting one-to-one sessions to register in-situ data requirements in the tool directly, please let us know and we can make arrangements accordingly both in-person and on-line.



We are here to support you. Please ask!

Final remarks

- **The requirements' value goes beyond the pure goal of collecting them**, as it makes data discovery more efficient, enables identifying the gaps, and may contribute to a global strategy for in situ data
- **GEO is the right place to promote the G-reqs methodology** to gather user requirements, coordinate an effort among the thematic GWP activities and generate consensus on in-situ products
- **GEO could incorporate G-reqs as part of the GEOSS infrastructure.** This will allow users to better find the in situ products that fulfil their requirements but also to make visible that some demanded products that do not yet exist and should be developed in the future
- **With G-reqs, the GEO community should offer a new capacity or a service:** to look for datasets that match some user data requirement but are not accessible now, and explore which community could be interested in exposing it and cover an emerging user's need.

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Scientific Paper in Remote Sensing.
Maso J., Brobia A., Voidrot M.F., Zabala A., Serral I. (2023) G-reqs, a New Model Proposal for Capturing and Managing In Situ Data Requirements: First Results in the Context of the Group on Earth Observations. Remote Sensing. Vol.15(6). DOI: https://doi.org/10.3390/rs15061589.

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BACK UP SLIDES

Context

- Canberra Declaration [1] (November 2019):
  - *Recognises the critical role that data collected from the atmosphere, land, and water (in-situ data) plays in achieving GEO's mission;*
  - *Calls for GEO community to develop a strategy to address the challenges in this area and to demonstrate progress in implementation*
- GEO In-situ Data Strategy (2019):
  - *Characteristics of the in situ data landscape*
  - *Identify and showcase specific use cases to illustrate benefits, challenges, and the wealth of in situ data use*

[1] https://earthobservations.org/canberra_declaration.php

Taking advantage from CIS^2 and more

- CIS^2 [2] is an open database designed to record the requirements **of the Copernicus services**, ESA, and EUMETSAT **for in situ data**, how far they are met, the origin of each dataset, how each dataset is used, their importance, and the barriers to their seamless use,
- In order to provide a clear picture of what data is already available and what would be needed to deliver improved and more reliable products and monitoring services.

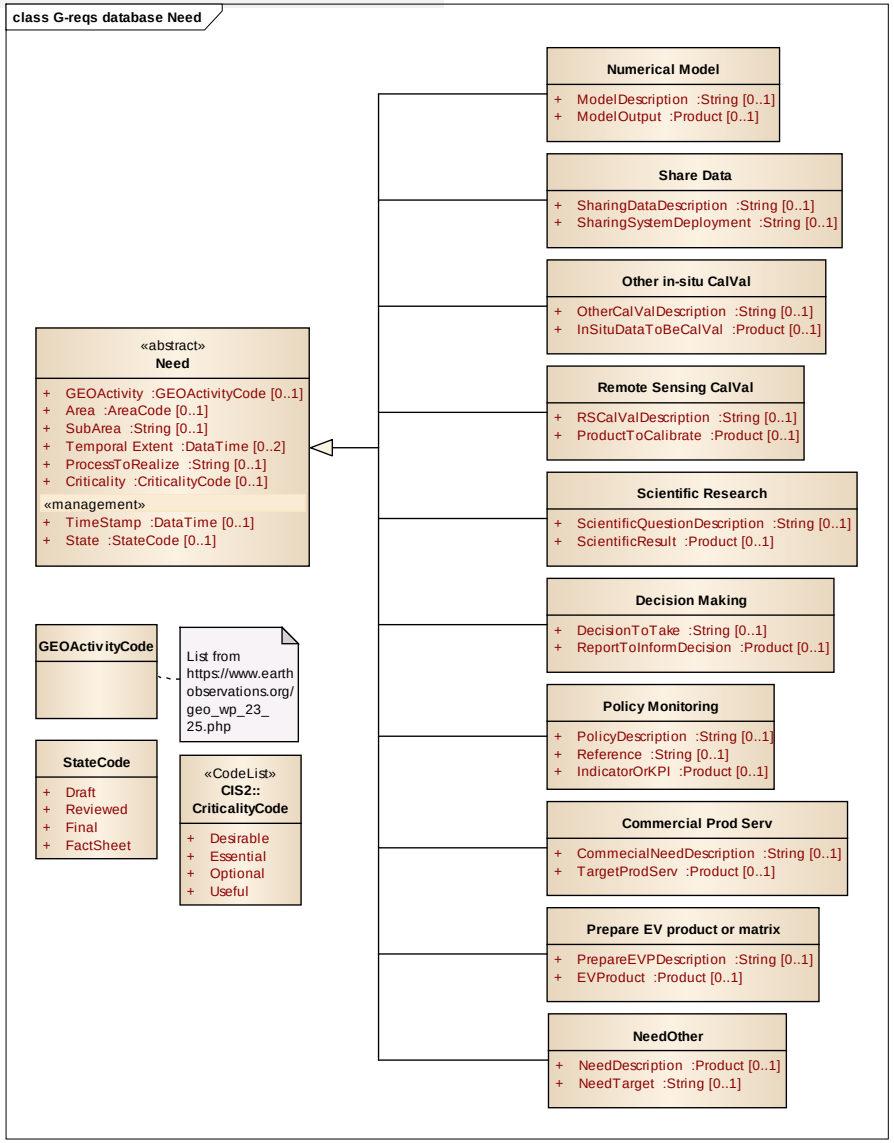
ID	Name	Dissemination	Quality Control Procedure	Group	Uncertainty	Update Frequency	Timeliness	Scale	Horizontal resolution	Vertical resolution
12	Sea level	NRT Service	Automatic	Ocean Ocean Ocean	0,05m 0,02m 0,01m	1h 30min 10min	1h 10 min 2min		200km 50km 10km	T: - B: - G:

- The World Meteorological Organization (WMO) OSCAR requirements database [3] and the OSAAP from NOAA [4] are other examples of efforts done by organizations in collecting requirements for EO in general and for in-situ in particular.

[2] https://cis2.eea.europa.eu/
[3] https://space.oscar.wmo.int/requirements
[4] https://www.nesdis.noaa.gov/about/our-offices/office-of-system-architecture-and-advanced-planning-osaap

Types of target needs

- **G-reqs** targets the **needs** of the **GEO Work Program activities**
- Some examples of types of needs are:
  - *Remote sensing Cal/Val*
  - *Numerical Model Cal/Val*
  - *Other in-situ Cal/Val*
  - *EV products*
  - *Scientific Research*
  - *Share Data*
  - *Commercial Product or Service*
  - *Policy monitoring, indicator or KPI*
  - *Decision Making*



Detailed view of the Need class and subclasses as in the G-reqs UML model.

Making the case for in-situ data (Factsheets)

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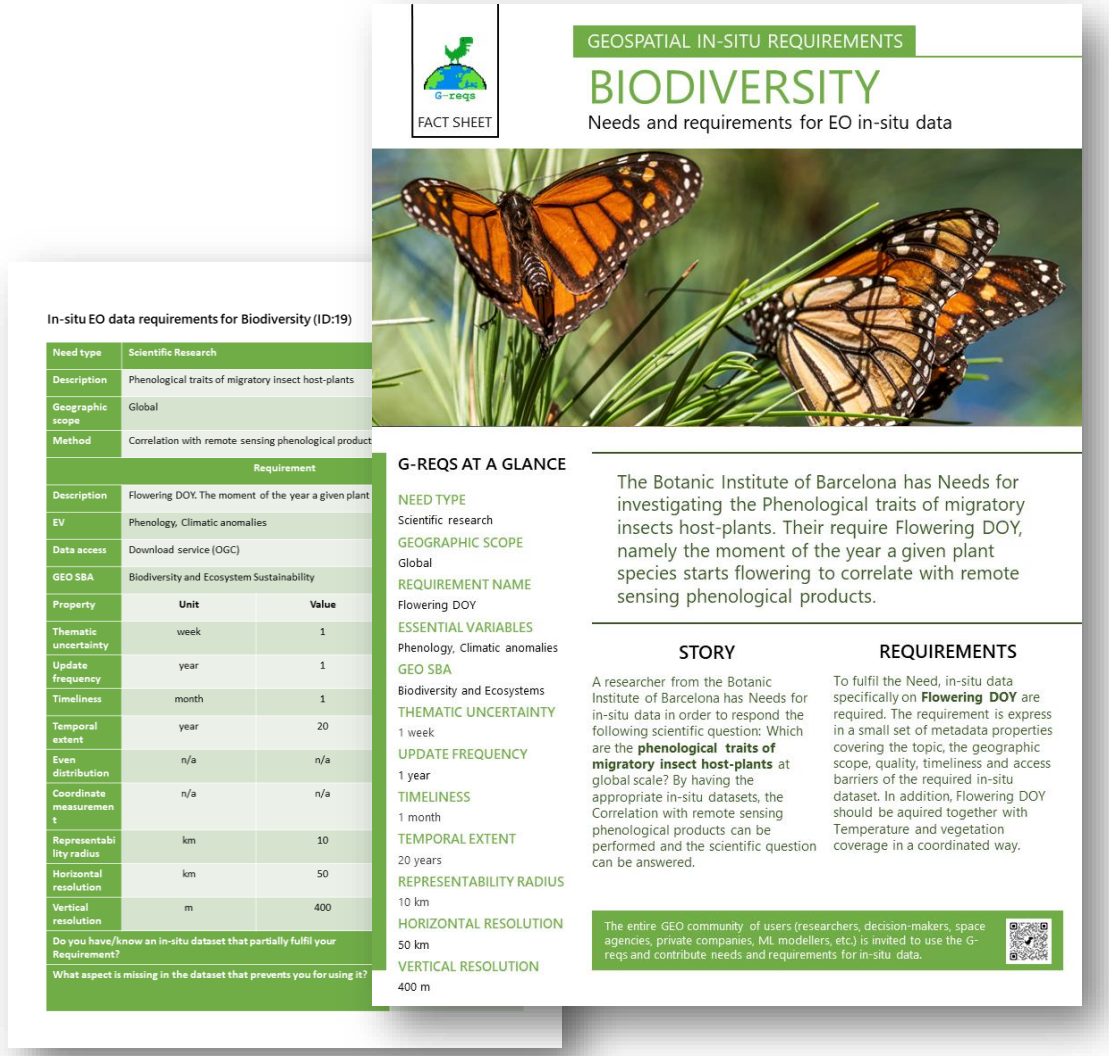


In-situ EO data requirements for Biodiversity (ID:19)

Need type	Scientific Research
Description	Phenological traits of migratory insect host-plants
Geographic scope	Global
Method	Correlation with remote sensing phenological product
	Requirement
Description	Flowering DOY. The moment of the year a given plant
EV	Phenology, Climatic anomalies
Data access	Download service (OGC)
GEO SBA	Biodiversity and Ecosystem Sustainability

Property	Unit	Value
Thematic uncertainty	week	1
Update frequency	year	1
Timeliness	month	1
Temporal extent	year	20
Even distribution	n/a	n/a
Coordinate measurement	n/a	n/a
Representability radius	km	10
Horizontal resolution	km	50
Vertical resolution	m	400

Do you have/know an in-situ dataset that partially fulfil your Requirement?

What aspect is missing in the dataset that prevents you for using it?

FACT SHEET

GEOSPATIAL IN-SITU REQUIREMENTS

BIODIVERSITY

Needs and requirements for EO in-situ data

G-REQS AT A GLANCE

NEED TYPE
Scientific research

GEOGRAPHIC SCOPE
Global

REQUIREMENT NAME
Flowering DOY

ESSENTIAL VARIABLES
Phenology, Climatic anomalies

GEO SBA
Biodiversity and Ecosystems

THEMATIC UNCERTAINTY
1 week

UPDATE FREQUENCY
1 year

TIMELINESS
1 month

TEMPORAL EXTENT
20 years

REPRESENTABILITY RADIUS
10 km

HORIZONTAL RESOLUTION
50 km

VERTICAL RESOLUTION
400 m

The Botanic Institute of Barcelona has Needs for investigating the Phenological traits of migratory insects host-plants. Their require Flowering DOY, namely the moment of the year a given plant species starts flowering to correlate with remote sensing phenological products.

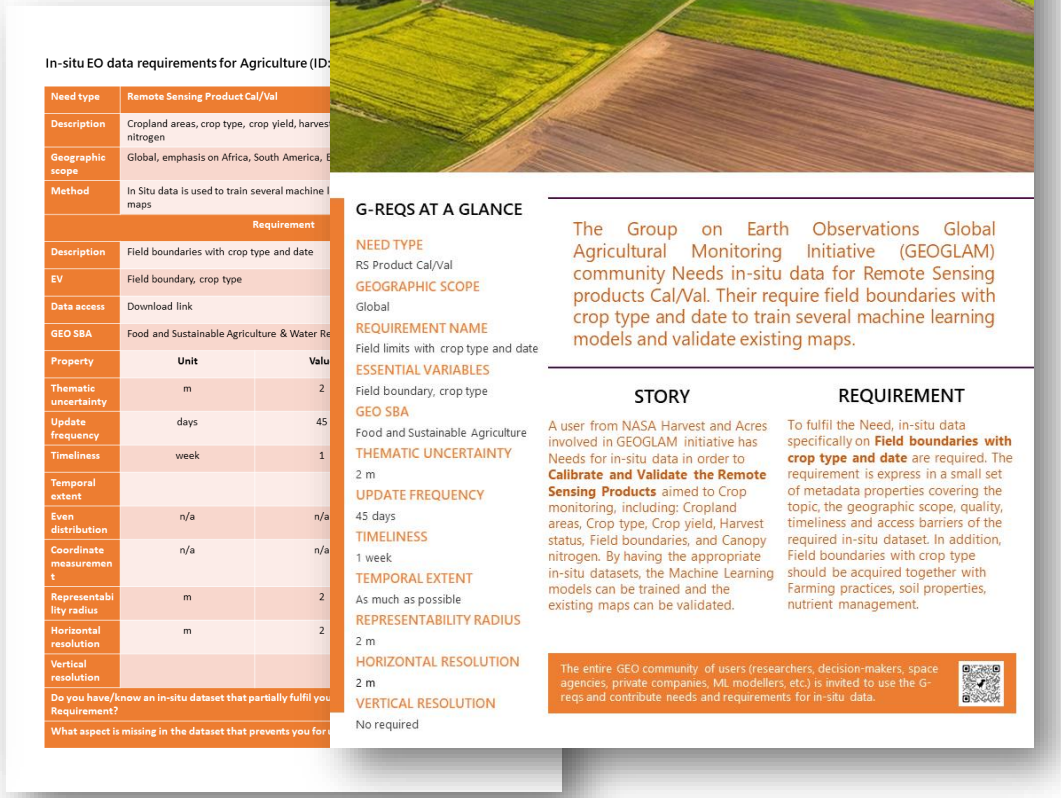
STORY

A researcher from the Botanic Institute of Barcelona has Needs for in-situ data in order to respond the following scientific question: Which are the **phenological traits of migratory insect host-plants** at global scale? By having the appropriate in-situ datasets, the Correlation with remote sensing phenological products can be performed and the scientific question can be answered.

REQUIREMENTS

To fulfil the Need, in-situ data specifically on **Flowering DOY** are required. The requirement is express in a small set of metadata properties covering the topic, the geographic scope, quality, timeliness and access barriers of the required in-situ dataset. In addition, Flowering DOY should be aquired together with Temperature and vegetation coverage in a coordinated way.

The entire GEO community of users (researchers, decision-makers, space agencies, private companies, ML modellers, etc.) is invited to use the G-reqs and contribute needs and requirements for in-situ data.



In-situ EO data requirements for Agriculture (ID:

Need type	Remote Sensing Product Cal/Val
Description	Cropland areas, crop type, crop yield, harves nitrogen
Geographic scope	Global, emphasis on Africa, South America, E
Method	In Situ data is used to train several machine l maps
	Requirement
Description	Field boundaries with crop type and date
EV	Field boundary, crop type
Data access	Download link
GEO SBA	Food and Sustainable Agriculture & Water Re

Property	Unit	Valu
Thematic uncertainty	m	2
Update frequency	days	45
Timeliness	week	1
Temporal extent		
Even distribution	n/a	n/a
Coordinate measurement	n/a	n/a
Representability radius	m	2
Horizontal resolution	m	2
Vertical resolution		

Do you have/know an in-situ dataset that partially fulfil you Requirement?

What aspect is missing in the dataset that prevents you for

FACT SHEET

GEOSPATIAL IN-SITU REQUIREMENTS

AGRICULTURE

Needs and requirements for EO in-situ data

G-REQS AT A GLANCE

NEED TYPE
RS Product Cal/Val

GEOGRAPHIC SCOPE
Global

REQUIREMENT NAME
Field limits with crop type and date

ESSENTIAL VARIABLES
Field boundary, crop type

GEO SBA
Food and Sustainable Agriculture

THEMATIC UNCERTAINTY
2 m

UPDATE FREQUENCY
45 days

TIMELINESS
1 week

TEMPORAL EXTENT
As much as possible

REPRESENTABILITY RADIUS
2 m

HORIZONTAL RESOLUTION
2 m

VERTICAL RESOLUTION
No required

The Group on Earth Observations Global Agricultural Monitoring Initiative (GEOGLAM) community Needs in-situ data for Remote Sensing products Cal/Val. Their require field boundaries with crop type and date to train several machine learning models and validate existing maps.

STORY

A user from NASA Harvest and Acres involved in GEOGLAM initiative has Needs for in-situ data in order to **Calibrate and Validate the Remote Sensing Products** aimed to Crop monitoring, including: Cropland areas, Crop type, Crop yield, Harvest status, Field boundaries, and Canopy nitrogen. By having the appropriate in-situ datasets, the Machine Learning models can be trained and the existing maps can be validated.

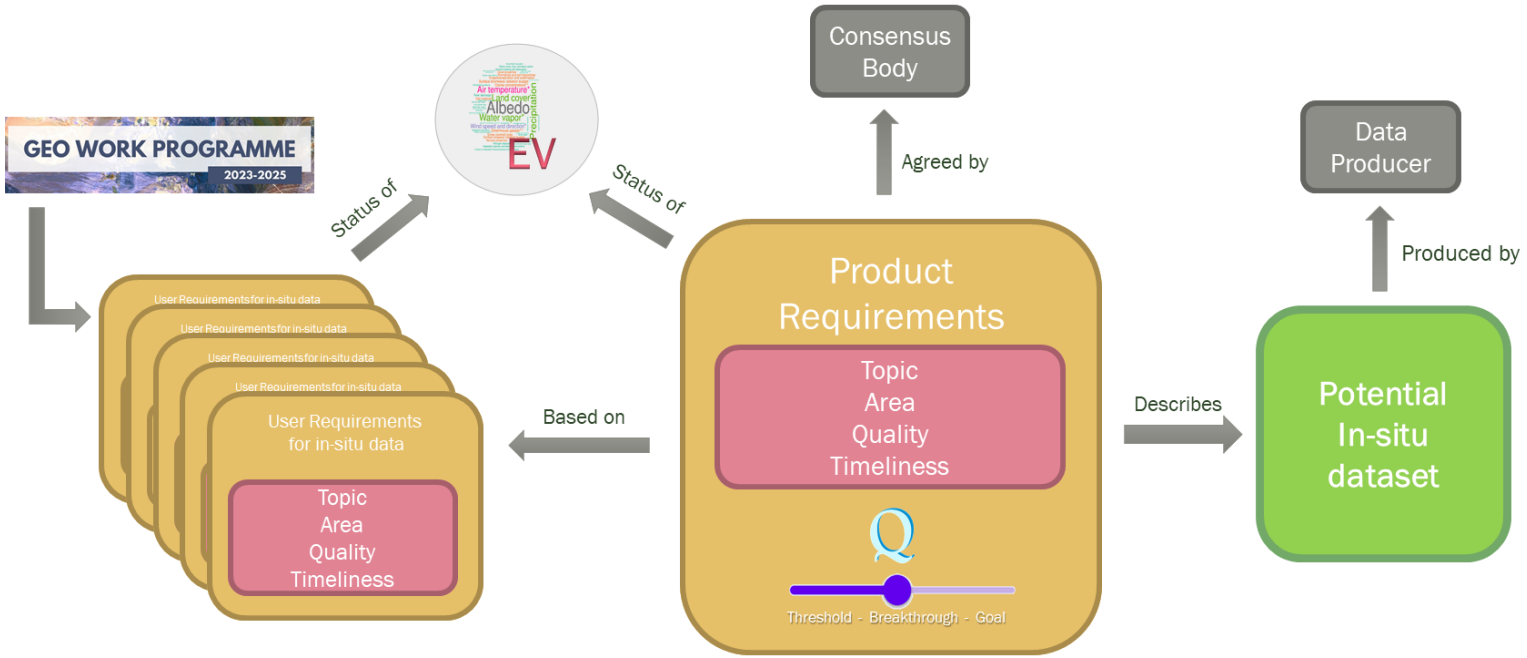
REQUIREMENT

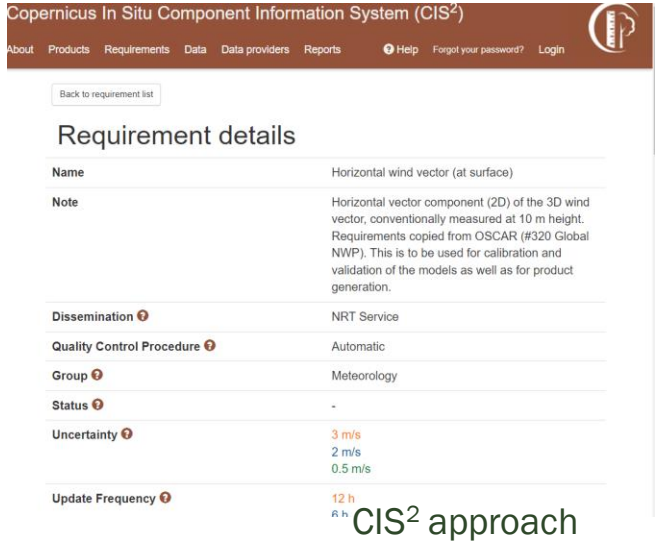
To fulfil the Need, in-situ data specifically on **Field boundaries with crop type and date** are required. The requirement is express in a small set of metadata properties covering the topic, the geographic scope, quality, timeliness and access barriers of the required in-situ dataset. In addition, Field boundaries with crop type should be acquired together with Farming practices, soil properties, nutrient management.

The entire GEO community of users (researchers, decision-makers, space agencies, private companies, ML modellers, etc.) is invited to use the G-reqs and contribute needs and requirements for in-situ data.

Future: From User to Product Requirements

- The final aim of G-reqs is improve the availability of in-situ data by stimulating the dialogue between users and data producers to improve the availability of in-situ data
- The elaboration of Product Requirements require a consensus process (covering several data User requirements)
- An In-Situ Product Requirement can be trace back to original user requirements





CIS² approach