

# Sentinel-2 Semantic Data Cube Austria

sen2cube  .at

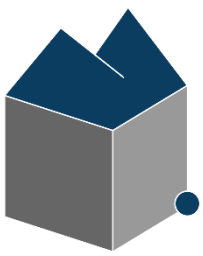
## Project partners



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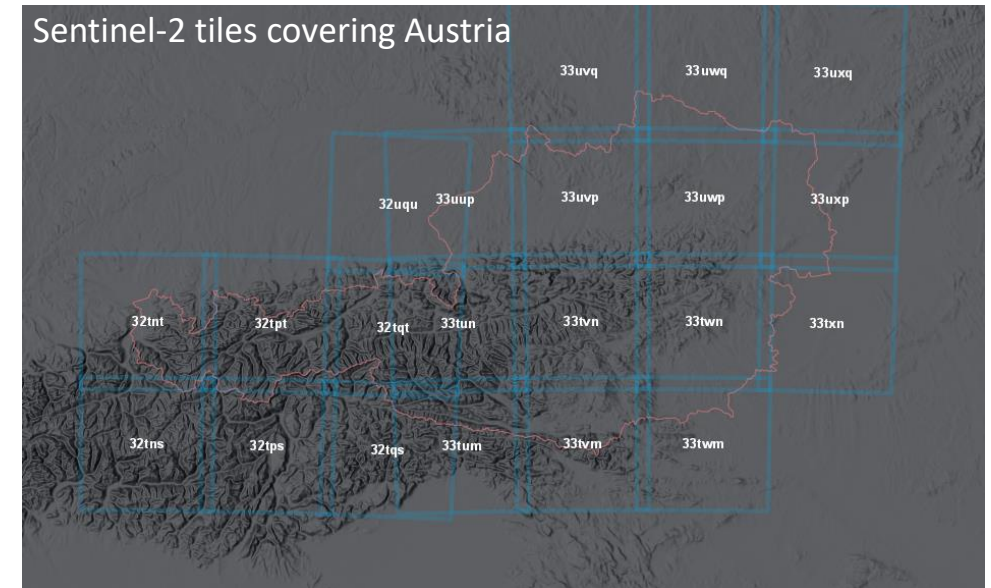
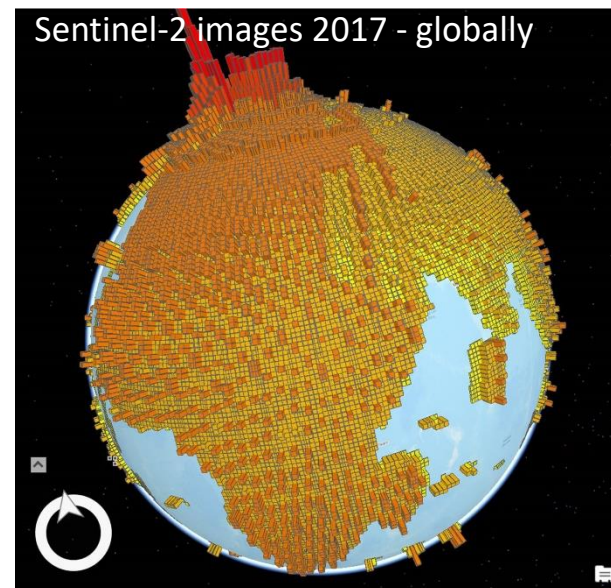
Sen2Cube.at is a project funded under  
the Austrian Space Applications  
Programme (ASAP 14)



# Sentinel-2 Semantic Data Cube Austria

Sentinel-2 Semantic Data Cube Austria (Sen2Cube.at):

- The overarching goal is to build an **Austrian data & information cube**
- Sen2Cube.at will exemplarily show that it is possible to
  - Conduct **semantic content-based image and information retrieval (SCBIR)** through time in big EO databases and
  - **allow human users to query and analyse EO data on a higher semantic level** (i.e. based on at least basic land cover units and encoded ontologies).





# "Conventional" queries of EO image archives

Conventional non-semantic queries of EO image archives (e.g., USGS Landsat, ESA Sentinel Data Hub). Search by:

- Metadata information.
  - ✓ Geographic area (AOI).
  - ✓ Acquisition time.
  - ✓ Sensor.
  - ✓ Summary quality indexes (e.g., image-wide cloud cover).
- "Thumbnail" image preview (RGB image QuickLook).



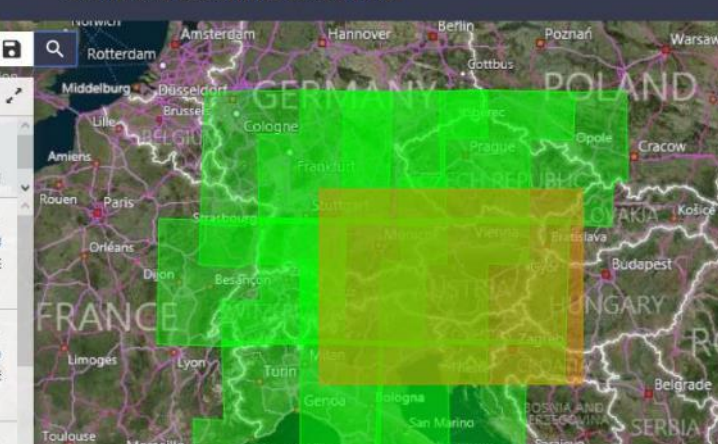
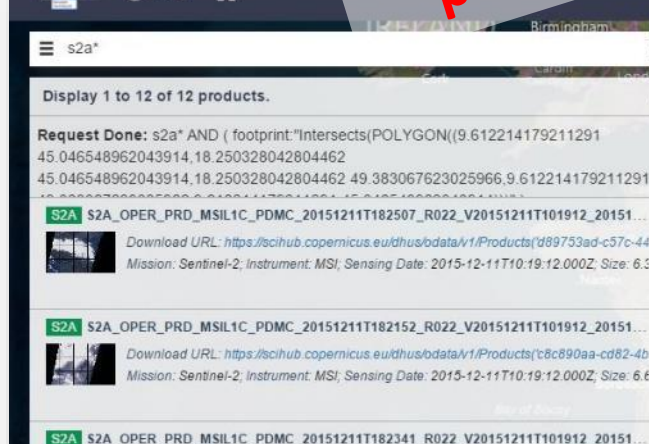
Collection Resolution Map Layers Tools File Help

Downloadable



• No semantic querying  
• No analysis capability  
• No extraction of higher-level information products through time

Sentinels Scientific Data Hub



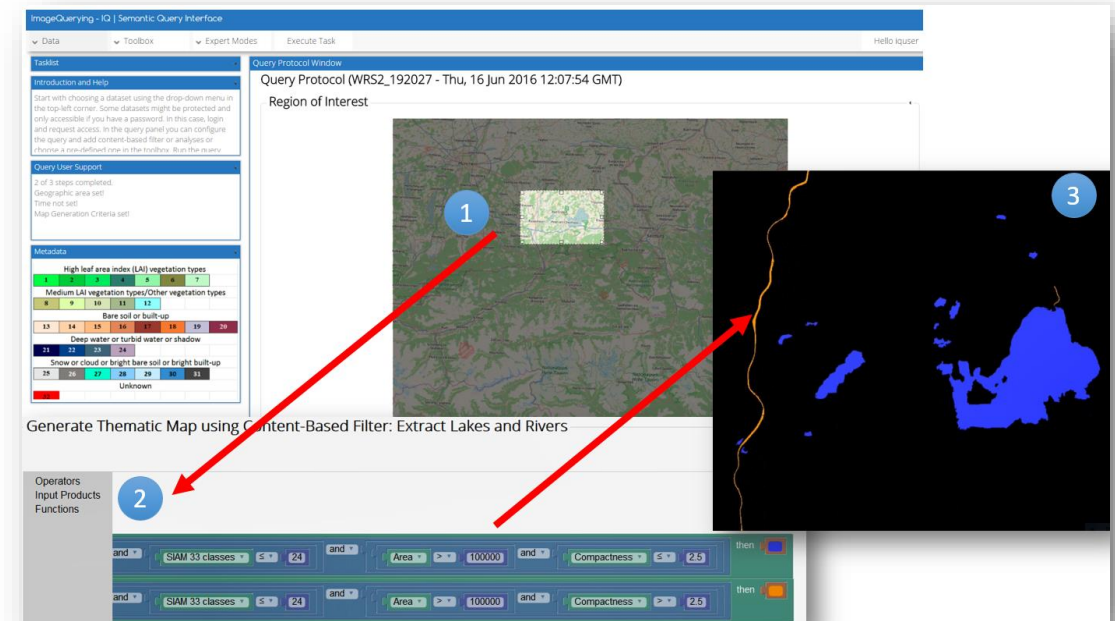


# Semantic Content Based Image Retrieval and Analysis

**Sen2Cube.at:** a Semantic Content Based Image and Information Retrieval System through time

- is expected to cope with spatiotemporal semantic queries such as ***“retrieve all images in the database where a lake is not covered by clouds and larger than a certain area”***.
- In addition, **information retrieval (semantic analysis)** within the system is possible, such as **“retrieve all pixels in the AOI flooded as least once in the selected time span”**
- Such an **SCBIR system must rely on image understanding as a pre-condition**. This makes the SCBIR problem at least as difficult (or ill-posed) as vision.

➔ **No SCBIR (Semantic Content Based Image Retrieval) system in operating mode is available to date.**

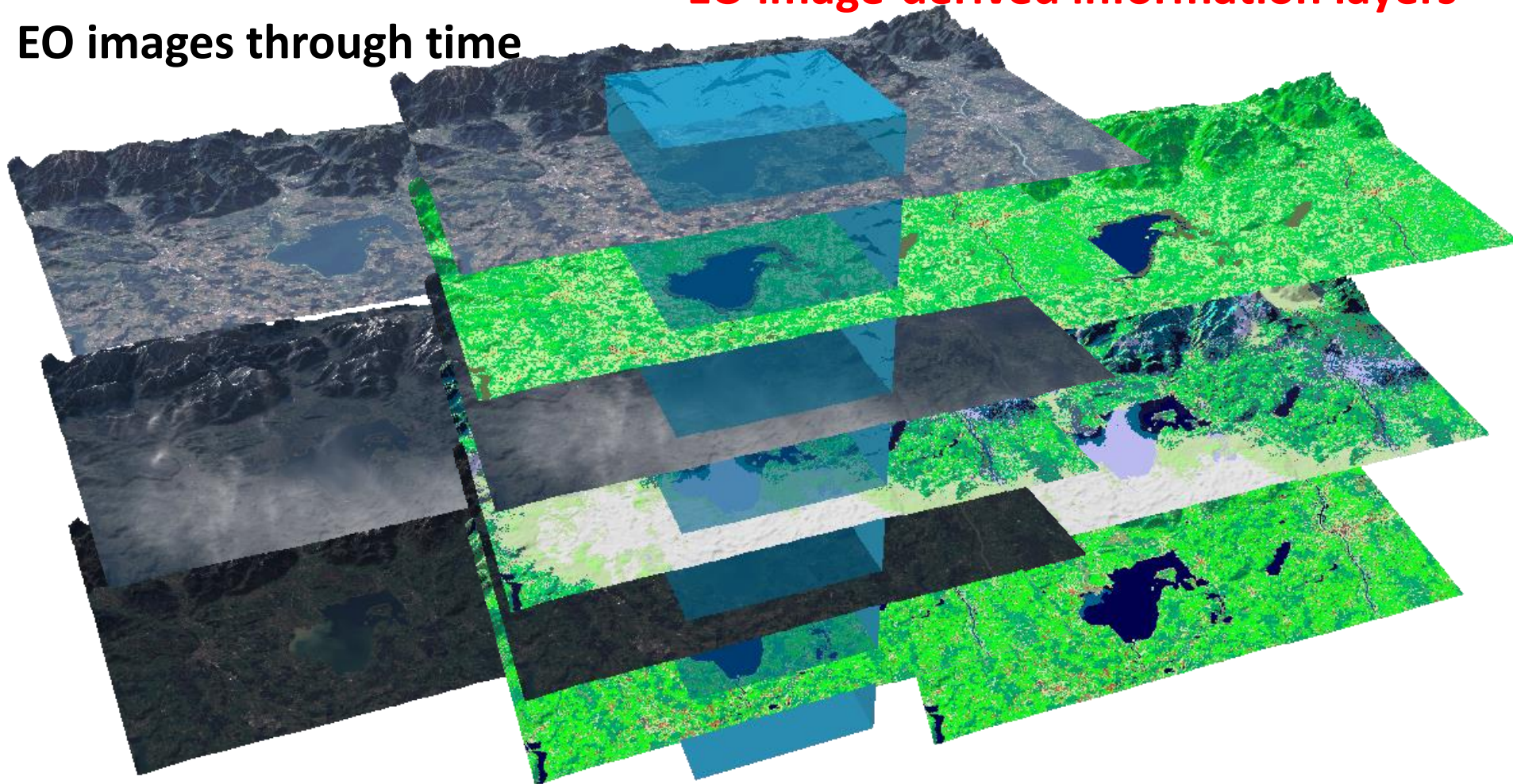




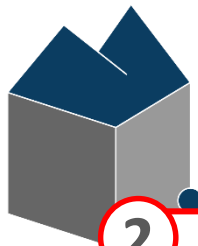
# Key concept of Sen2Cube.at for spatiotemporal analytics of multi-source EO big data

**EO image-derived information layers**

EO images through time



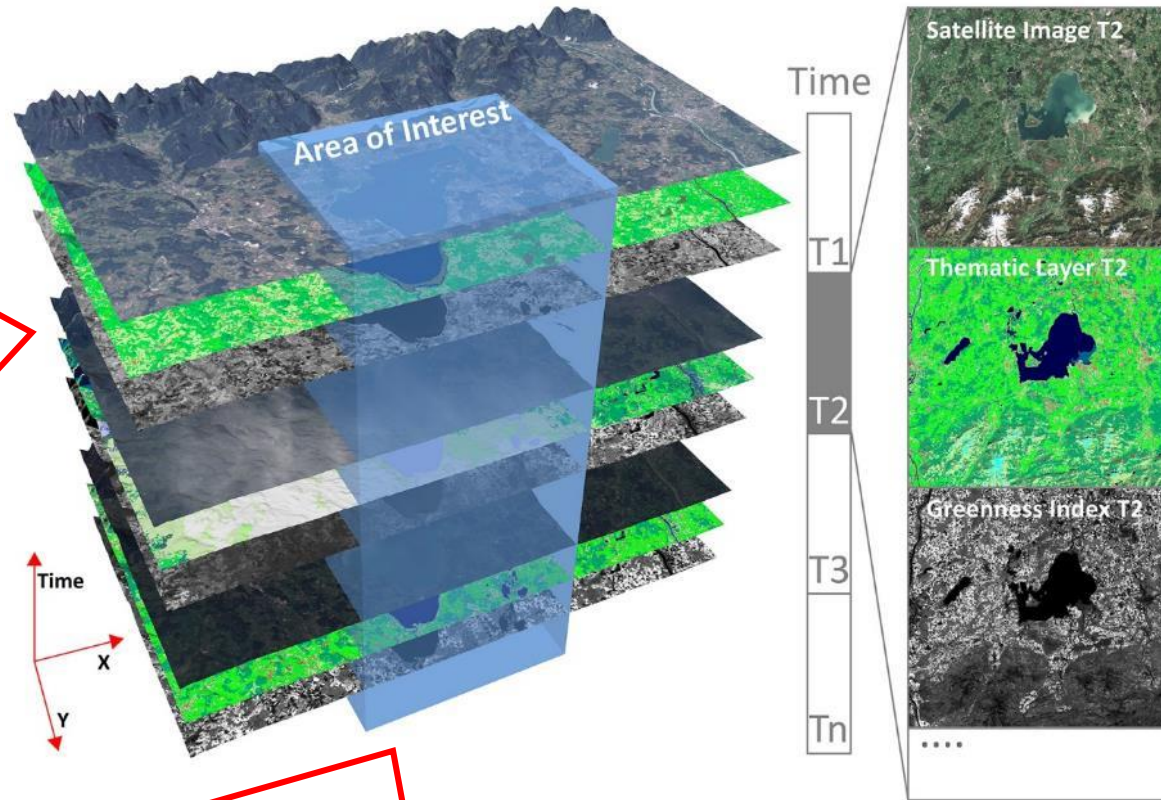
Area-of-interest (AOI) in a target-time (TT) window.



# Key concept of Sen2Cube.at for spatiotemporal analytics of multi-source EO big data

2

Data cube system storing images and image derived products for fast querying



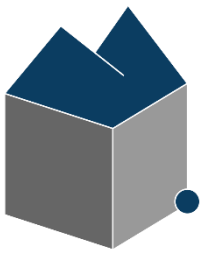
3

Semantic content-based queries through time and space in user defined AOIs by a graphical inference engine

1

Optical satellite image and associated *fully automatic data-derived* information layers

- The semantic enrichment used in Sen2Cube.at is based on a physical-model-based, spectral categorisation (SIAM) and additionally derived information.
- These processes will be fully automated and free of any user parametrisation.



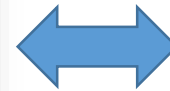
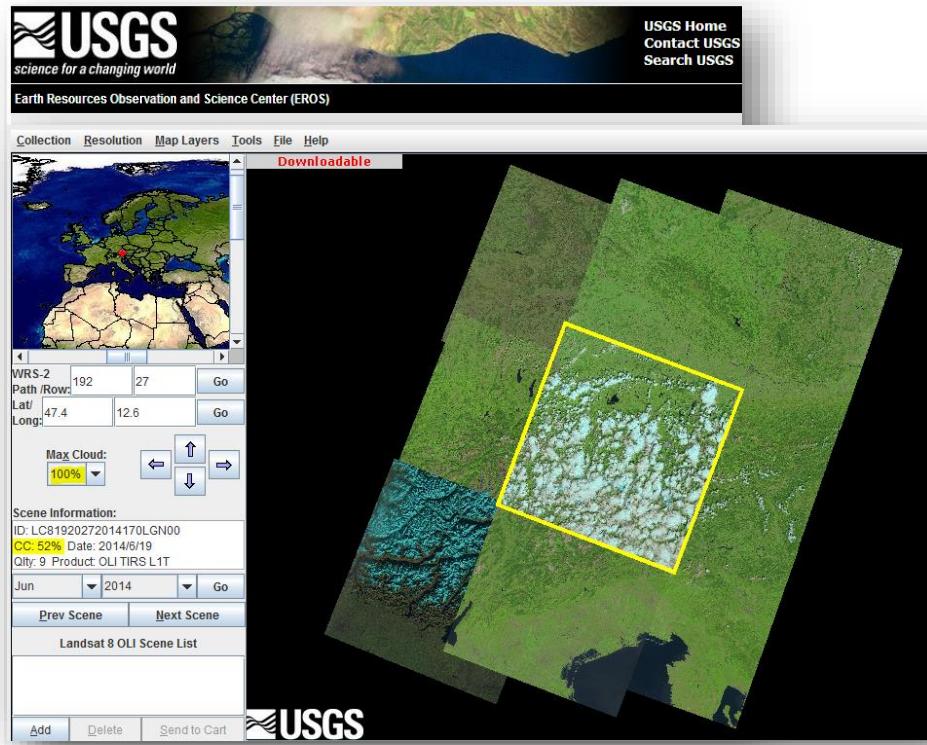
Demo services...

.....to be implemented in **one generic semantic data cube**

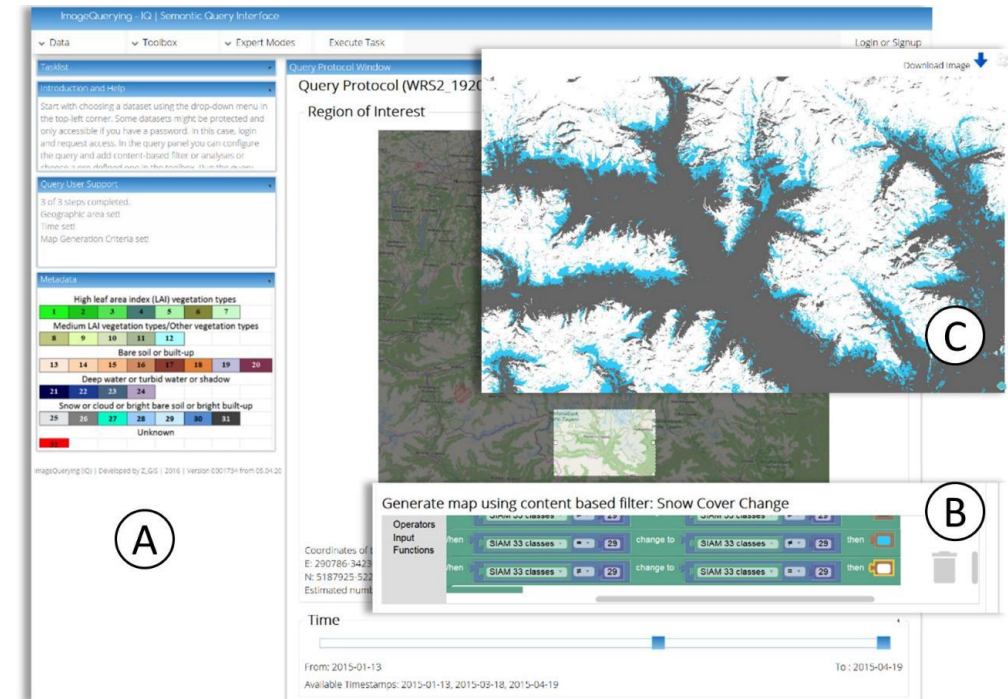


# Demo 1: semantic queries for content-based image retrieval

- develop knowledge-based semantic queries
- search and select Sentinel-2 scenes based on their content



An inference engine for enhanced querying will be programmed as a Web interface in a client-server solution.



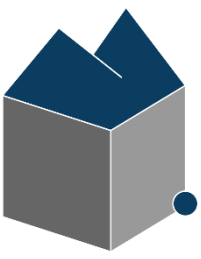


## Demo 2: user-defined cloud-free mosaics and composites

- apply pre-defined semantic queries through time
- user-defined areas-of-interest and timeframes
- better selection of best-suited pixels on the fly using semantics



Source: Sentinel-2



## Demo 3: location-based access

- historical data-derived trends where you are (or elsewhere)
  - location-based access
- example prototype developed in IQ4Sen
  - ZAMG project
  - implemented by SpaSe





# Demo 3: location-based access

IQ  
mobile

With this app you ask for information based on Earth observation data. Your question has to include your current position, a time span which you can choose and a topic which you can select.

Question progress monitor

100%

What was the status of Snow

Topic

Vegetation

Snow

during 01.12.2016 and 05.04.2017

Time Span

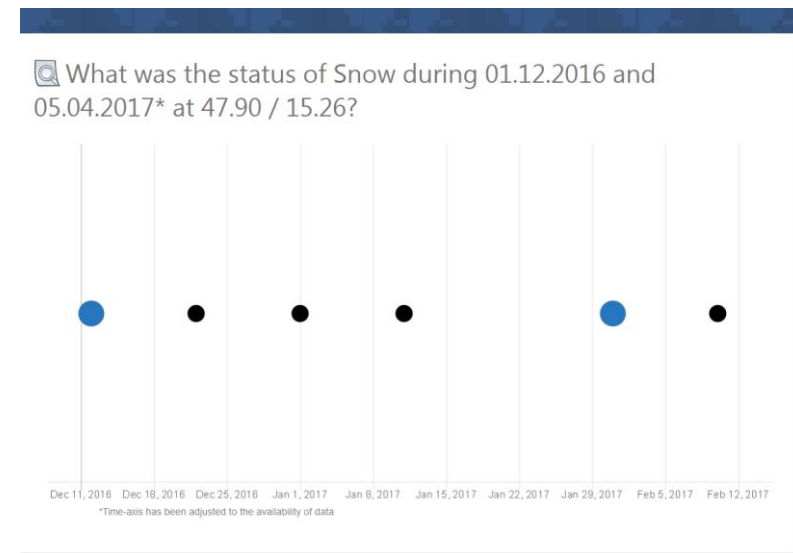
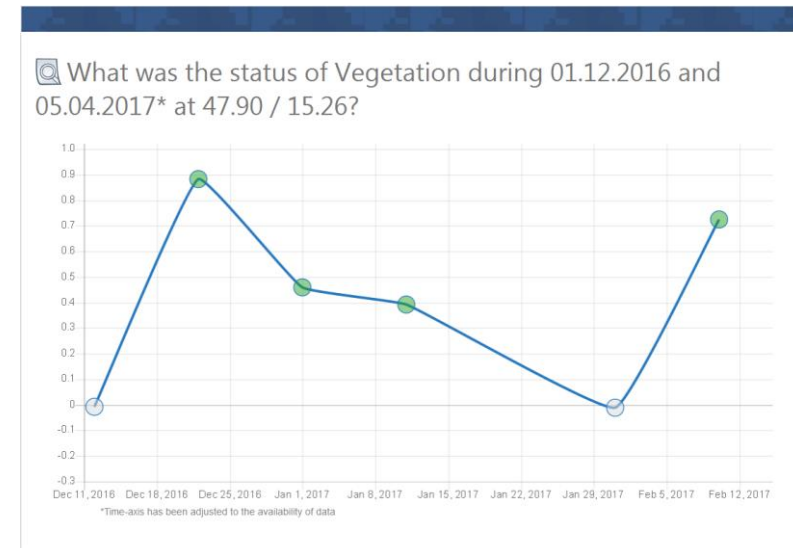
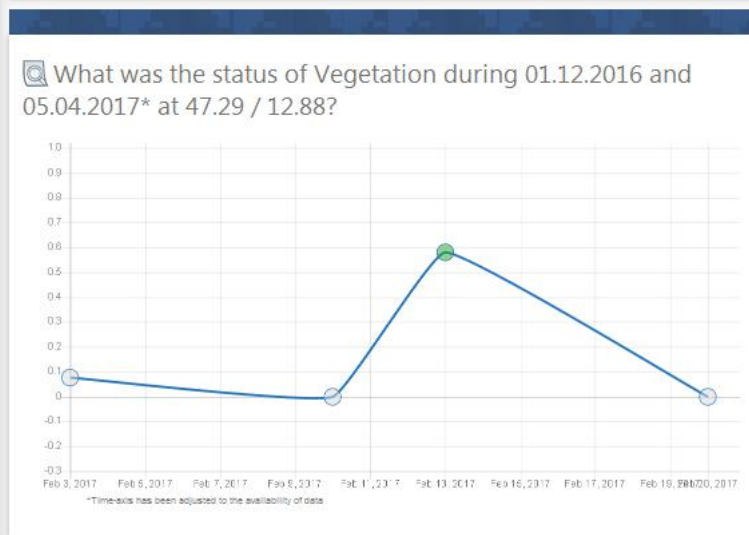
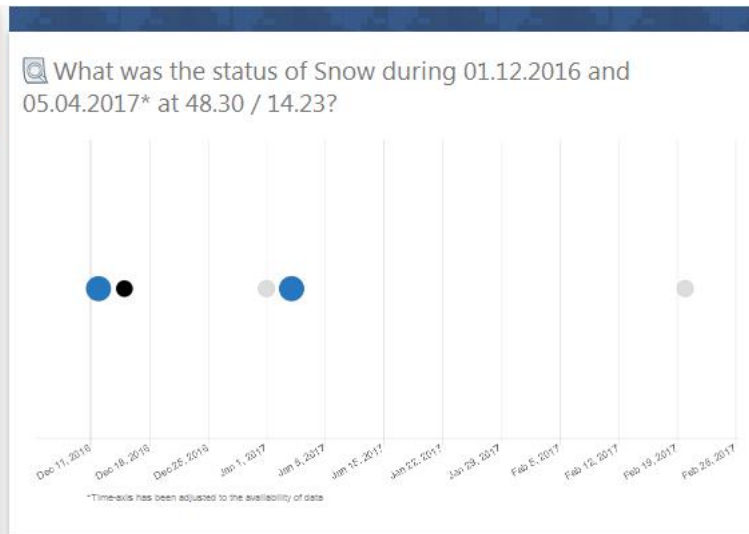
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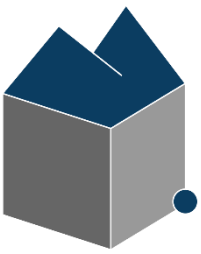
End:  
05. Apr 2017

at 47.29 / 12.88

Location

?



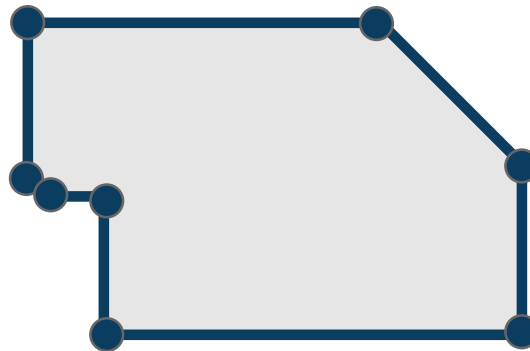


## Demo 4: per-parcel statistics

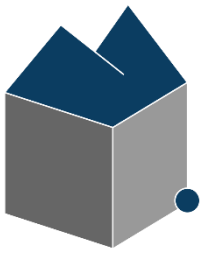
- allow user-defined parcel calculations for spectral and semantic profiles through time
- particularly relevant for forestry and agricultural domains



Source: Sentinel-2



- vegetation trends
- event detection
- when snow was last detected
- ...



# Danke für Ihre Aufmerksamkeit

<http://sen2cube.at/>

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