

LVM GEO Data Cube for Earth Observation Data

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LVM GEO



Presentation content

EO challenges

Open Data Cube - ODC

Datacube capabilities and products



LVM GEO

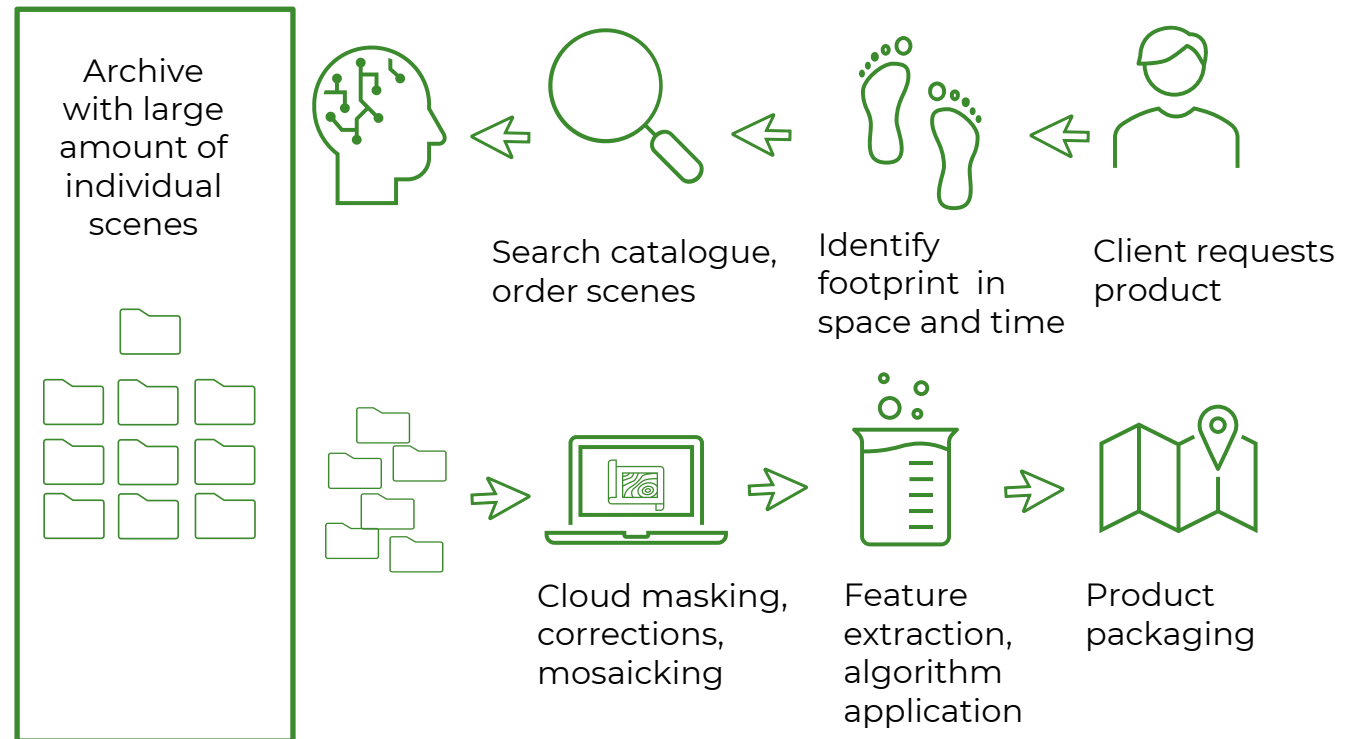
EO data challenges

1. Too large to be downloaded locally for analysis

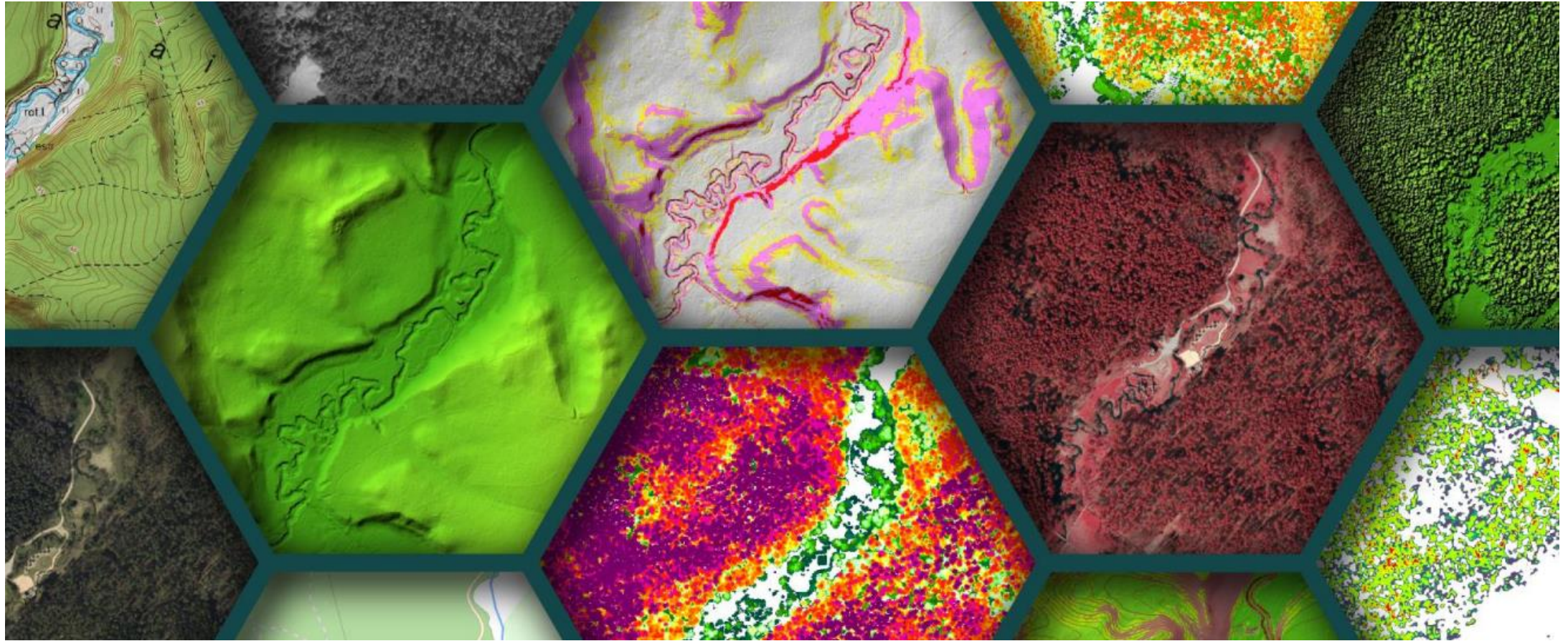
2. Organized in granules – complicated to manage and analyze

3. Proper connections between data, applications and users

Traditional remote sensing process

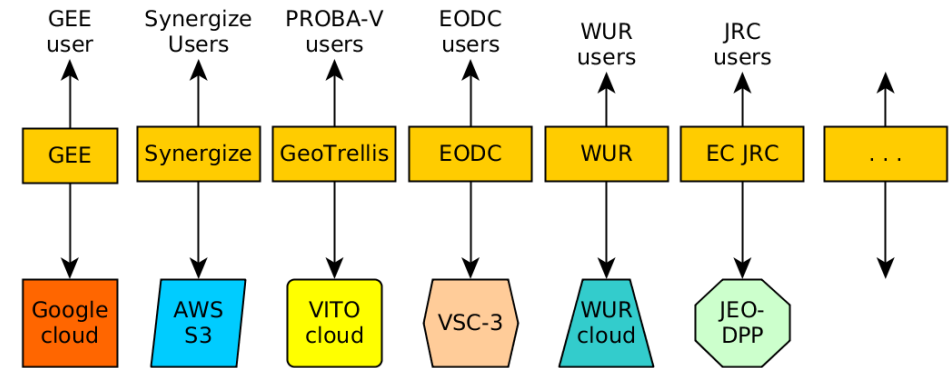


LVM and remote-sensing data

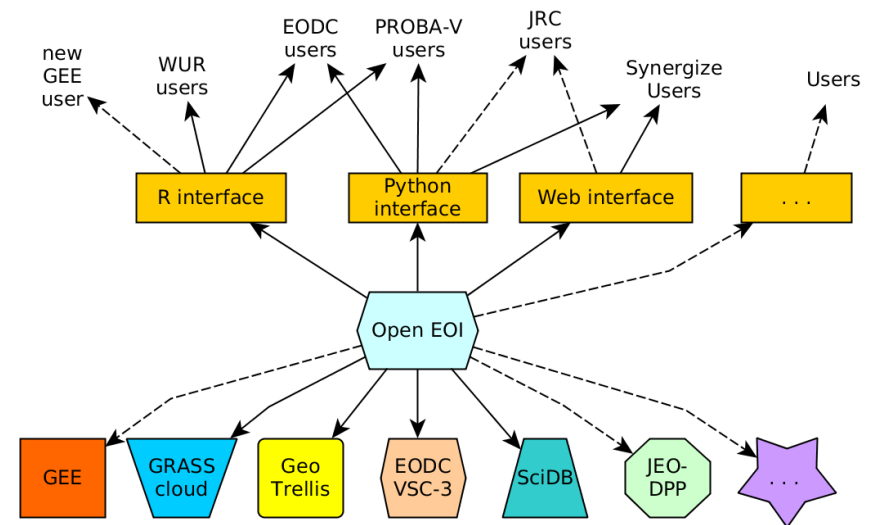


Similarities in GIS history and EO data management

Big Earth Observation data: the 10's: reminds of isolated GIS - strong systems but a certain problem in one system it is *practically* impossible to try to solve it in another system too



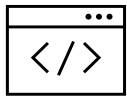
Open EO Interface: the 20's :
a client and back-end neutral set of API's for both sides
a driver for each back-end that translates the neutral requirements into the platform specific offerings
a driver for each client that binds the interfaces to the particular front-end such as R or python



Open Data Cube - ODC



Catalogue large amounts of EO data



Provide a Python based API for high performance querying and data access



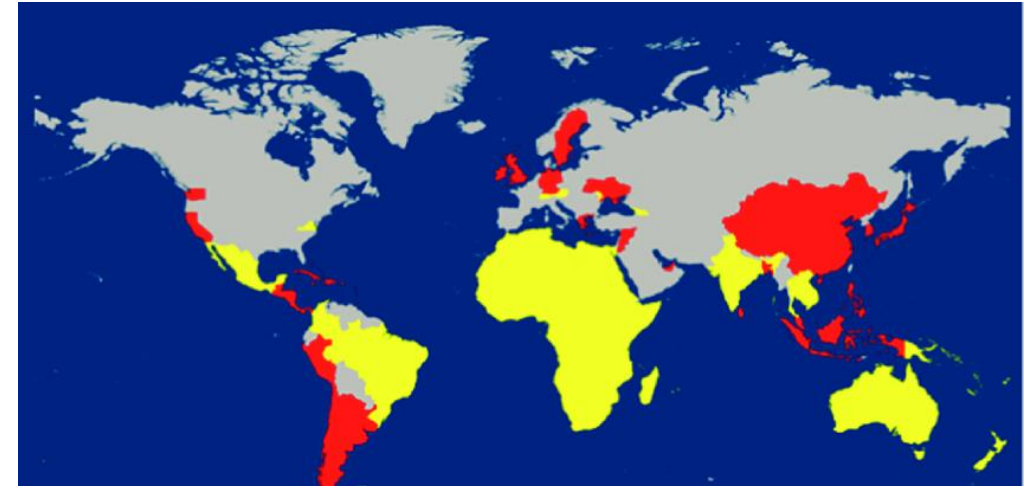
Give scientists and other users easy ability to perform Exploratory Data Analysis



Allow scalable continent scale processing of the stored data



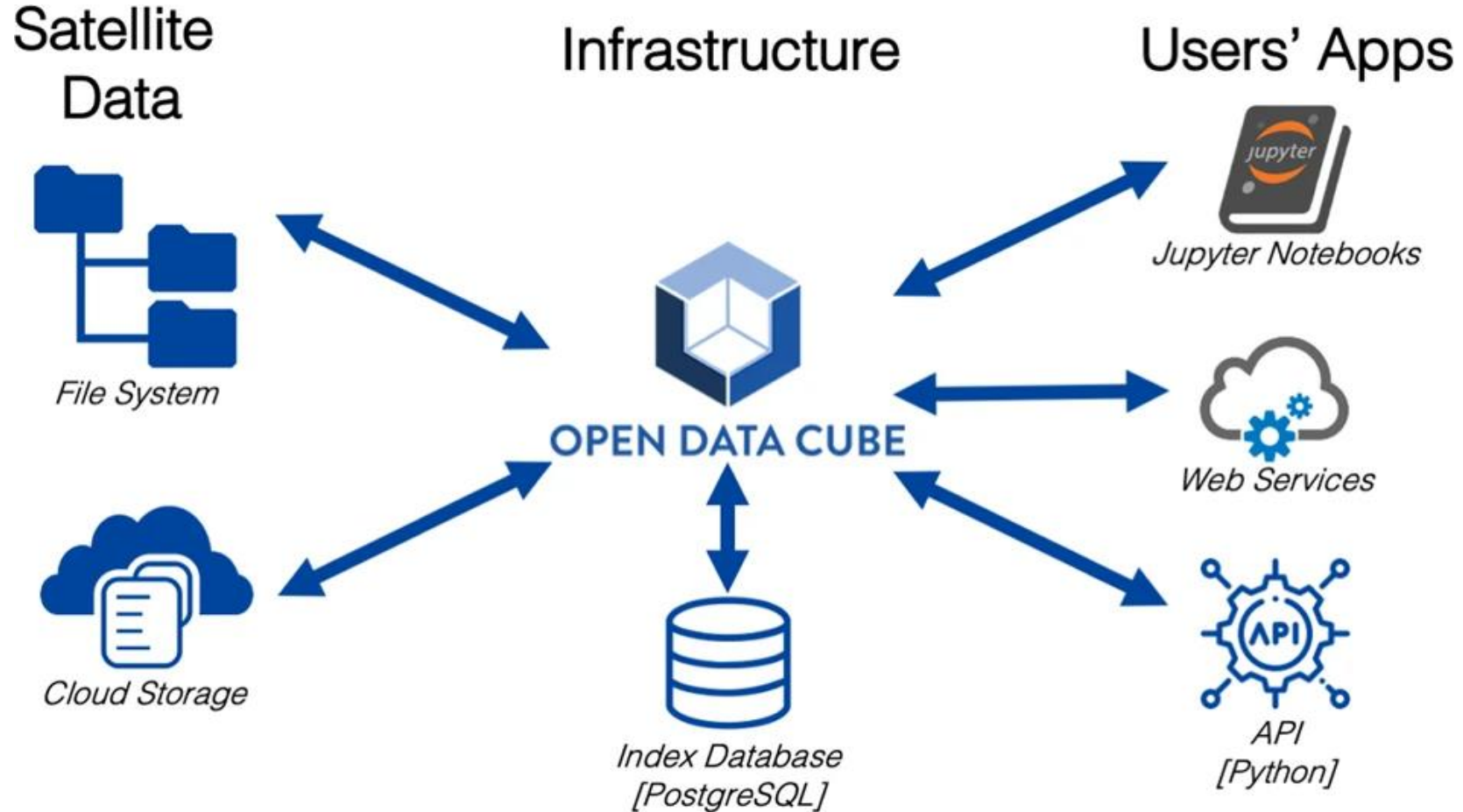
Track the provenance of all the contained data to allow for quality control and updates



Sudmanns M. et al. 2022

Implementations in more than
100 countries
22 operational cubes in 2022

ODC general architecture and software

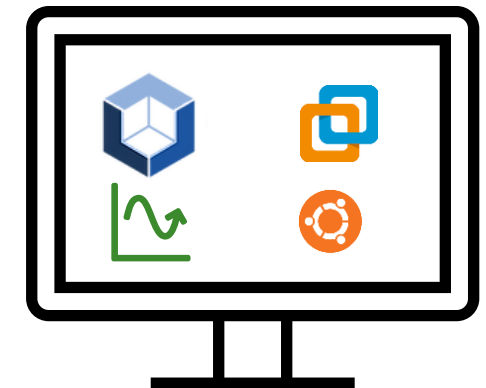


ODC implementation in LVM GEO

1. LVM announced a technology acceleration program **Silvatech in 2021**

2. We used the in-house opportunity to explore the **ODC implementation process**

3. After the Silvatech in 2022, the ODC was set up on dedicated virtual work-station



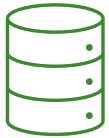
First steps towards products



Summer season geomedians



Select statistics tool



Select data sources
(Sentinel-2 L2A)



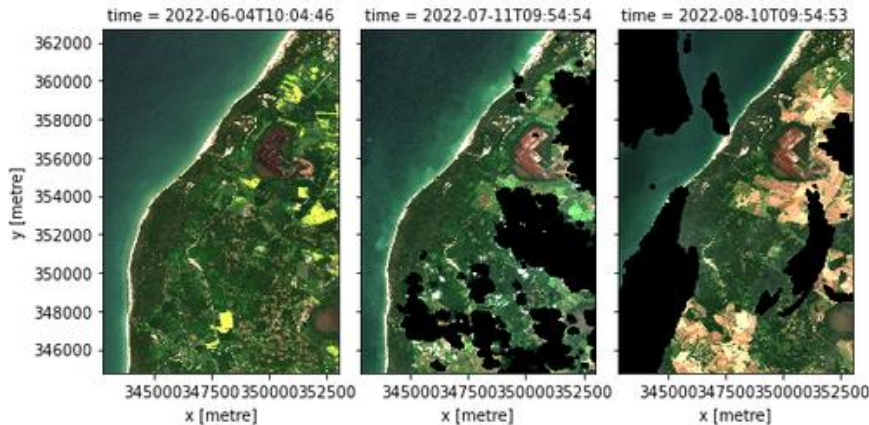
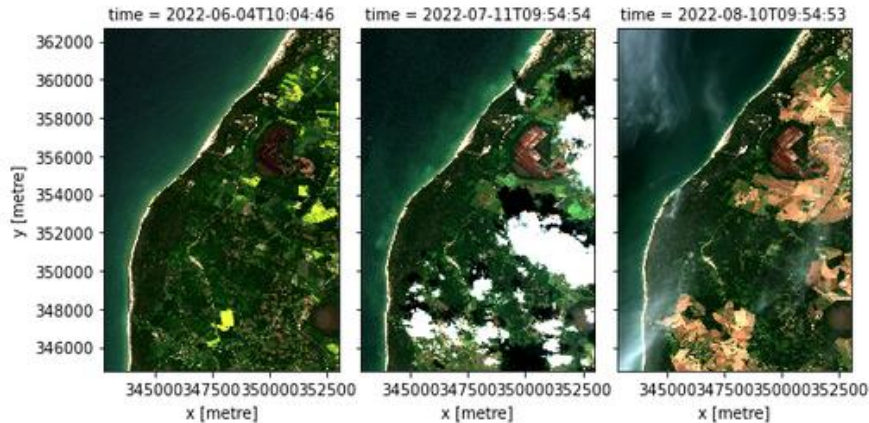
Configure tasks
(time, regions, resolution)



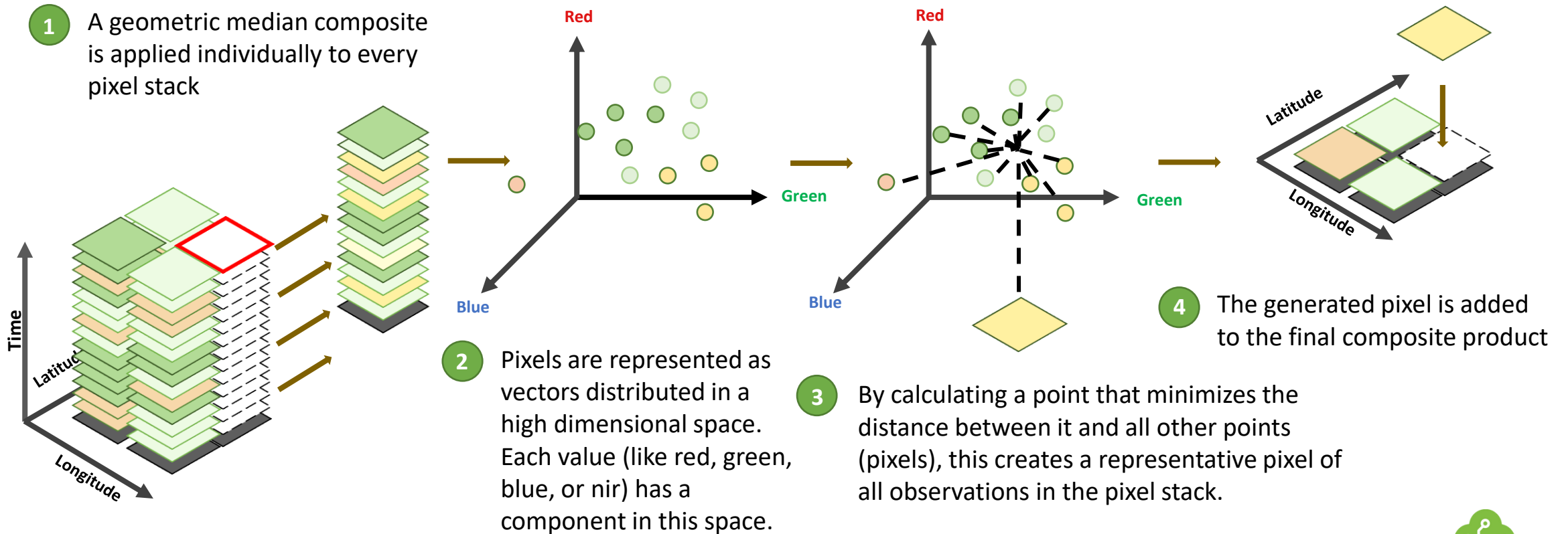
Create product
definition file



Execute tasks






Geomedian concept



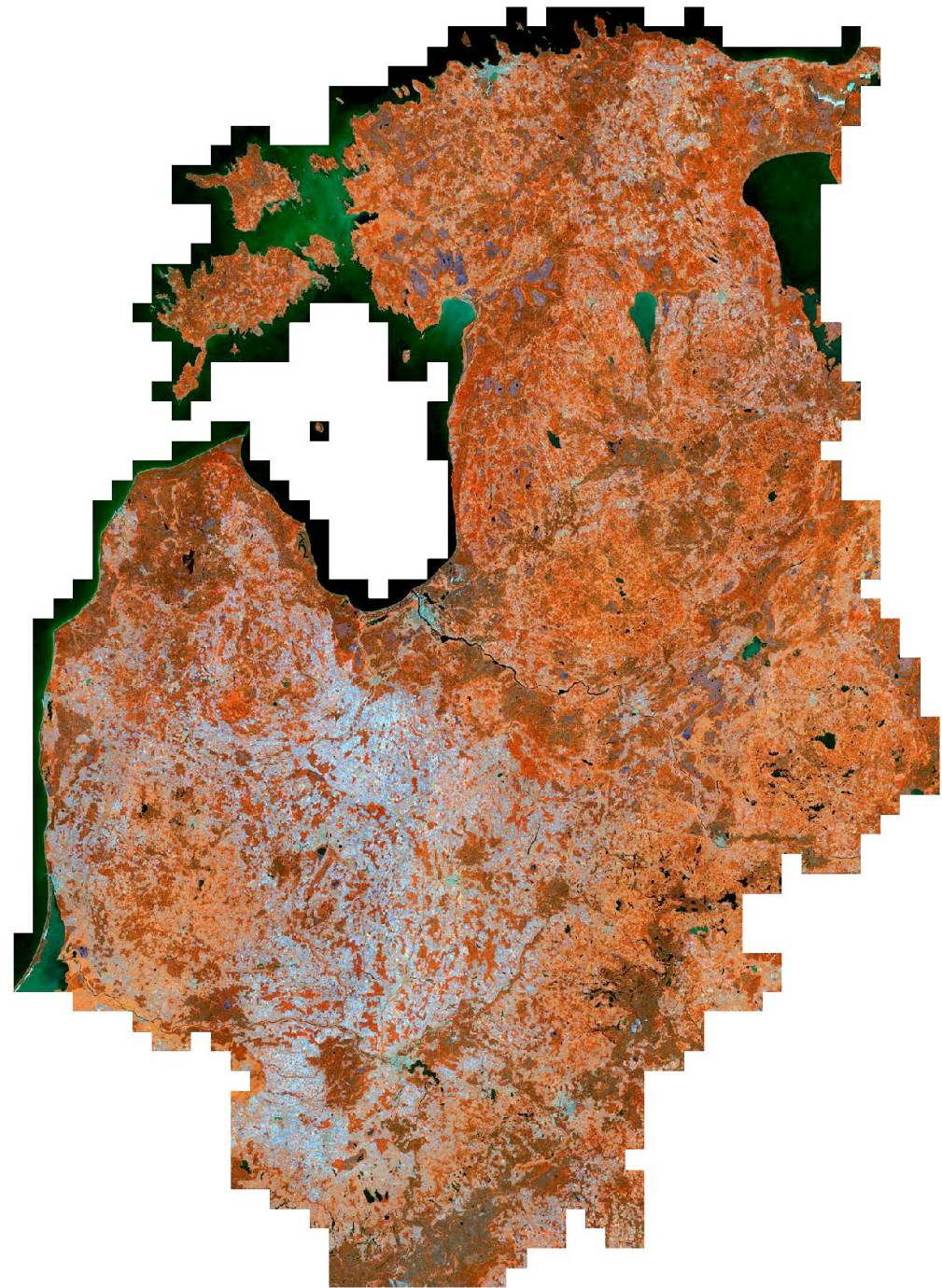
Regional Scale

Summer months geomedian observations

 5 Years 2018-2022 DATA	 10 metre pixel RESOLUTION
 10 bands SPECTRE	 2 days/season COMPUTE



LVM GEO



Explore the Data Cube

Index the new data into the data cube

Available tools to explore metadata

Increased provenance and management up to individual input scenes and datasets

home >> products >> gm_s2_summer >> datasets

gm_s2_summer_x50y631_2019--P1Y.stac-item dataset of product gm_s2_summer

Region x50y631

↑ S2A	MSIL2A	20190627T095031	N0212	R079	T34VFJ	20190627T123031
↑ S2A	MSIL2A	20190607T095031	N0212	R079	T34VFJ	20190607T112230
↑ S2A	MSIL2A	20190627T095031	N0212	R079	T35VLD	20190627T123031
↑ S2B	MSIL2A	20190831T095039	N0213	R079	T34VFJ	20190831T131346
↑ S2B	MSIL2A	20190709T094039	N0213	R036	T34VFJ	20190709T123921
↑ S2A	MSIL2A	20190823T094031	N0213	R036	T35VLD	20190823T110138
↑ S2A	MSIL2A	20190826T095031	N0213	R079	T35VLD	20190826T141735
↑ S2B	MSIL2A	20190612T095039	N0212	R079	T35VLD	20190612T124245
↑ S2B	MSIL2A	20190602T095039	N0212	R079	T34VFJ	20190602T124536
↑ S2B	MSIL2A	20190602T095039	N0212	R079	T35VLD	20190602T124536
↑ S2B	MSIL2A	20190712T095039	N0213	R079	T34VFJ	20190712T124156
↑ S2A	MSIL2A	20190724T094041	N0213	R036	T34VFJ	20190724T111919
↑ S2B	MSIL2A	20190702T095039	N0212	R079	T35VLD	20190702T124410
↑ S2A	MSIL2A	20190813T094031	N0213	R036	T35VLD	20190813T113609
↑ S2B	MSIL2A	20190729T094039	N0213	R036	T34VFJ	20190729T123310



Added analysis capabilities



- Enables further analysis with simple and more sophisticated approaches
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- Simple example:



- Connect and load product
 - Calculate index
 - Define classes
 - Convert/export the data
-

- Relatively general product can be useful to multiple LVM business directions

Forest damage



Young forest stands



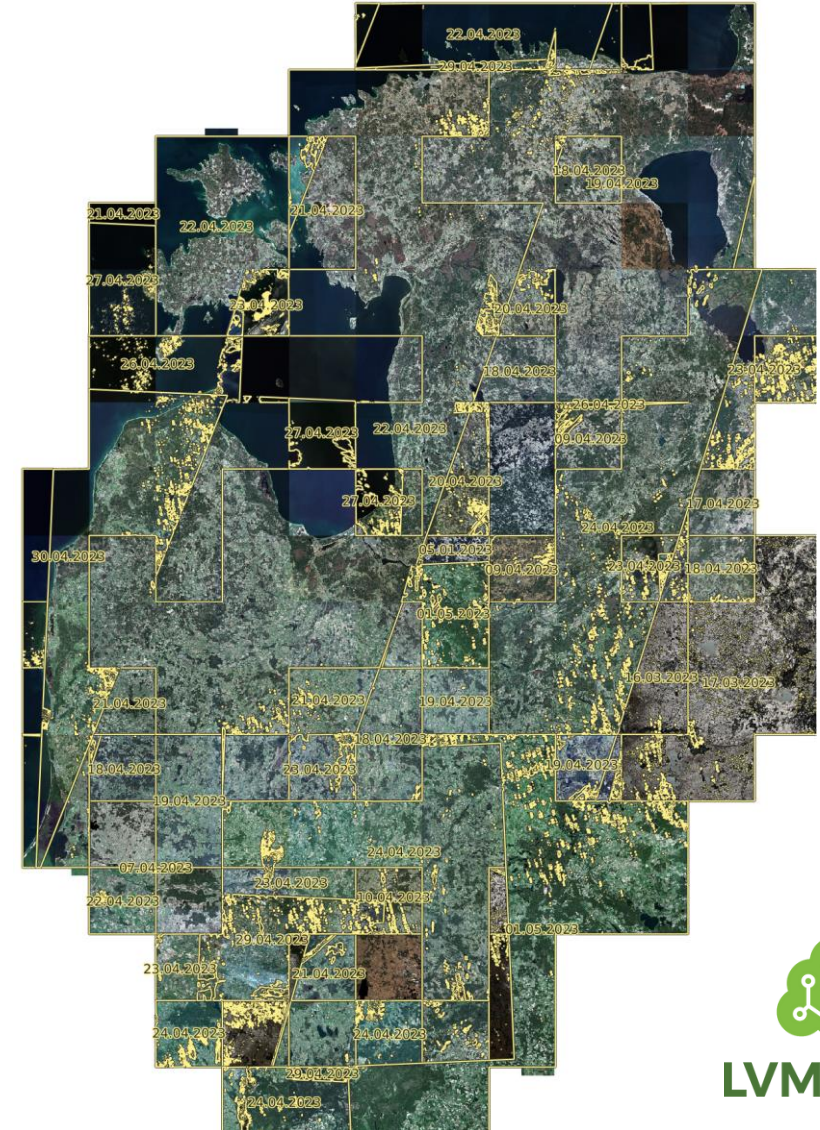
Quarry monitoring



Forest road development

Sentinel-2 cloudless mosaic

- Recent mosaic over Baltic region
- ODC tools enable to:
 - query data (time period, area, clouds 10%)
 - perform image analysis
 - stacking
 - mosaic generation
 - COG export
 - matadata



Conclusions

1. Powerful software

2. Steep learning curve

3. Recommended to join the community - Slack, GIS Stack Exchange

4. Intention to continue the LVM Geo data cube development to manage planned EO related projects



Thank you

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