



openEO
Platform

openEO Platform

EODC Forum 2021, Use Case Introduction

Alexander Jacob

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Roadmap and use cases



UC1: ARD

1. Systematic Feature Engineering
2. Pixel Level Phenology




UC3: Crop Features

1. Dynamic ML parametrisation
2. Sampling




UC9: Dynamic LC EU

1. High Volume SAR Analytics
2. Link to AIS tracking




UC2: Vessel Detection

1. Use existing Service
2. Generate Indices




UC 15: Crop Conditions

KO Sep '20 Iteration I, March ,21



Iteration II, Sep ,21

1. TS modelling
2. CD Event Alerting




UC6: NRT Forest

Iteration III, Mar ,22

1. Downscaling
2. Regression Modelling




UC8: Canopy Cover

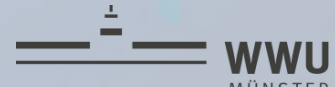
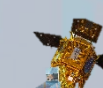
Iteration IV, Sep '22

1. Full Archive Frequency Reductions
2. BYOC



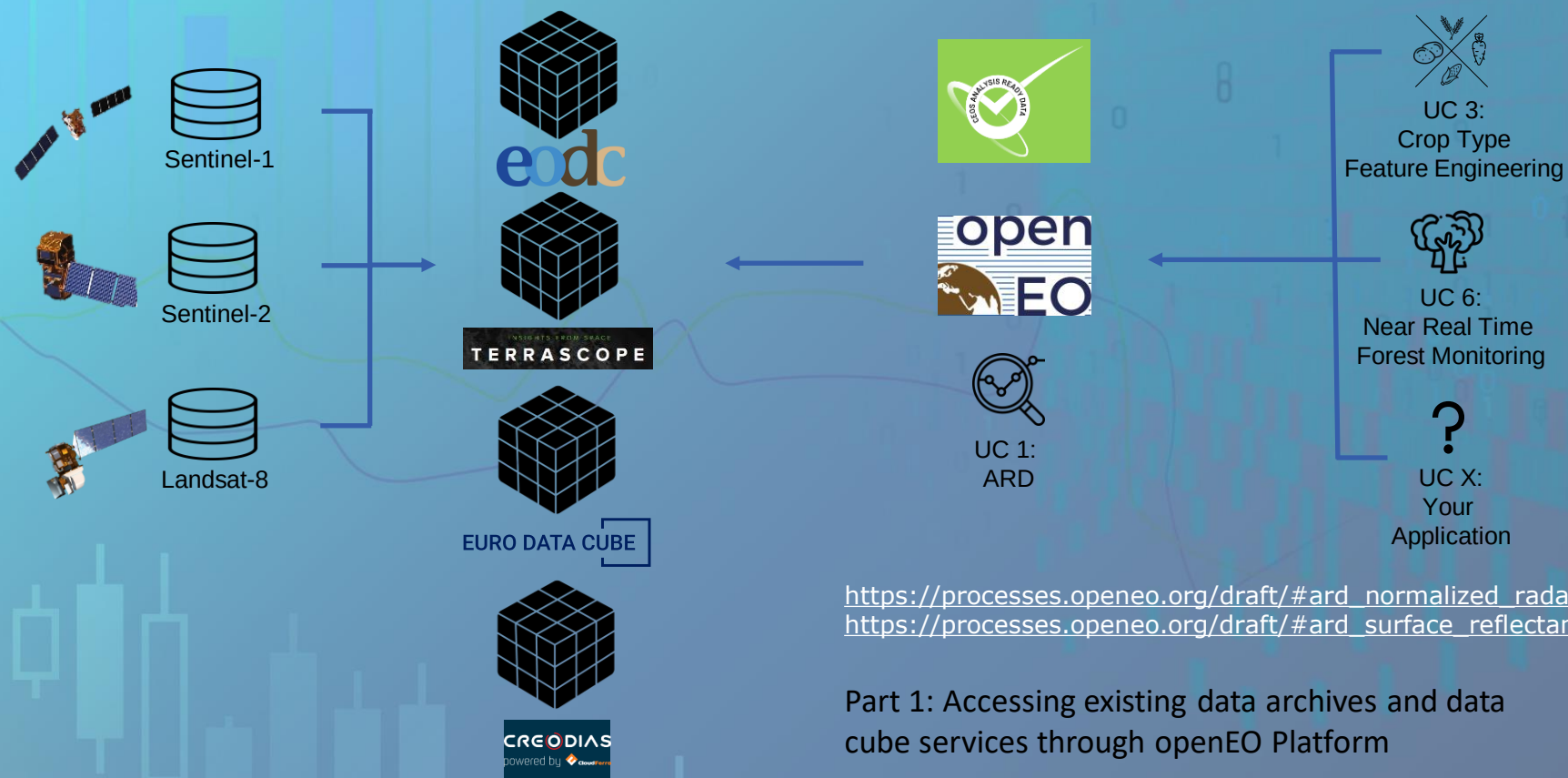

UC 11: Flood Risk

1. Temporal Resampling
2. Global Processing e.g. moving window

UC4: NO₂

Use Case 1: Analysis Ready Data



Part 1: Accessing existing data archives and data cube services through openEO Platform

Use Case 1: Analysis Ready Data



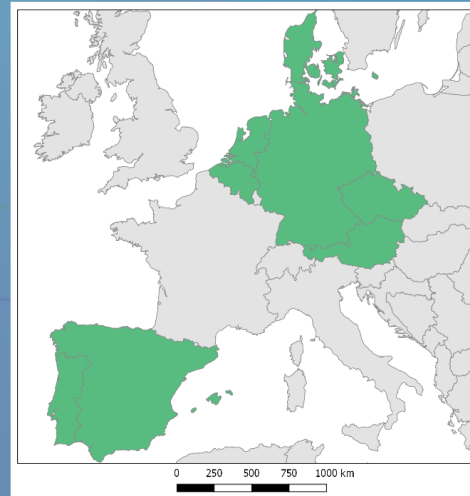
Part 2: Allow for on demand custom pre-processing using openEO

Use Case 3: Crop Feature Engineering

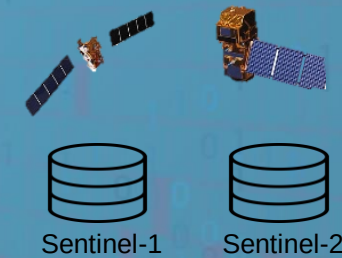
LPIS as part of CAP used for calibration and validation of 5 major crop types in the EU:

- Wheat
- Barley
- Maize
- Oilseeds (e.g. rape, soy or sunflower)
- Root Crops (e.g. Potato or sugar beet)

2018 campaign for calibration
2019 campaign for validation



8 countries covering
1,225,500 km²



Use Case 3: Crop Feature Engineering

Added Capabilities:

1. Automatic parcel detection and delineation for cropland mask based on S2
2. Phenology extraction at pixel level based on optical VI's
3. Calculation of pixel-based SAR and optical metrics
4. Rule-based assignment of crop classes based on SAR and optical metrics
5. Interactive visualization of the derived crop stratification and its evaluation

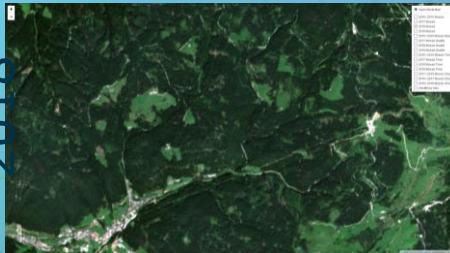
Demonstration:

- Execution of the crop stratification in 8 countries, i.e. (1), (2), (3) and (4).
- Elaboration on the required operators and processing steps
- added value of the parallelization on platform
- Visualization as in (5)

Use Case 6: Near Real Time Forest Dynamics



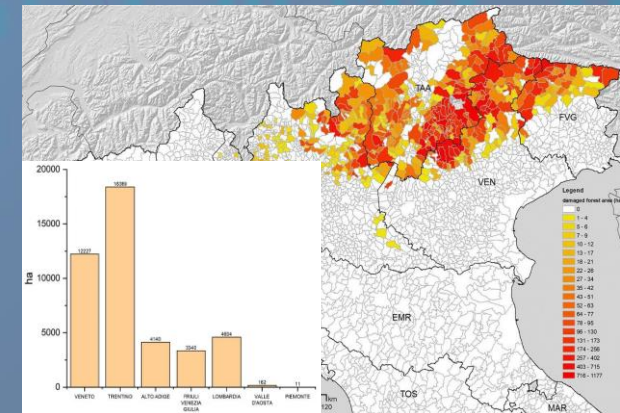
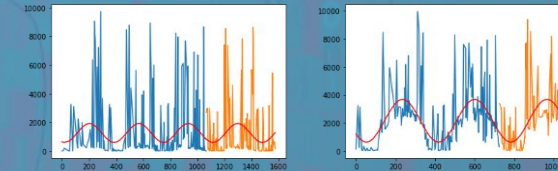
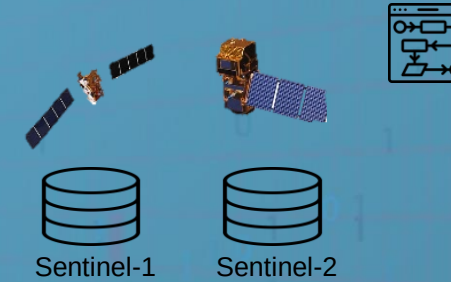
Summer 2018
Autumn 2018
Summer 2019



Herwart and Vaia Storm of 2018 in Germany, Austria and Italy:

2016-2018 campaign for calibration

2019-2020 campaign for validation



Use Case 6: Near Real Time Forest Dynamics



eurac
research

Added Capabilities:

1. Pixel-based time-series model fitting
2. Time-series based prediction
3. Change detection
4. Alarm system
5. Model recreation after change events

Demonstration:

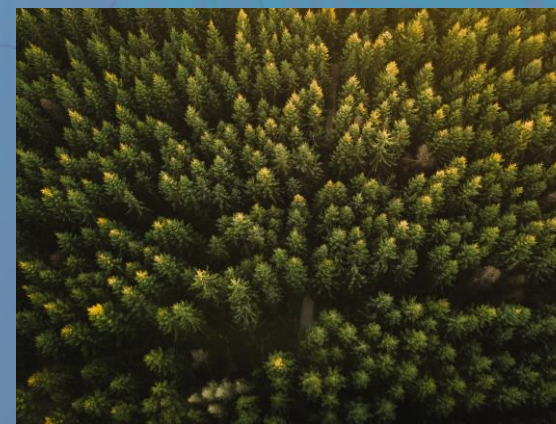
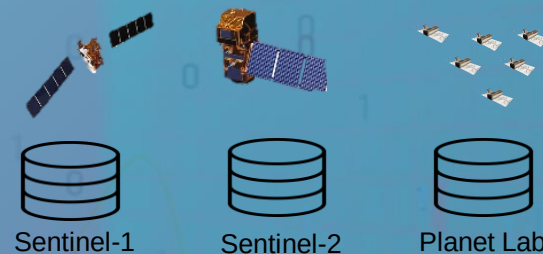
- Apply (1), (2) and (3) on S1 and S2 time series
- Dashboard featuring (4) and visualization of change map.
- Regional scale test based on 2018 events for validation.

Use Case 8: Fractional Canopy Cover

Utilize VHR imagery in
conjunction with Sentinel
data

For resource optimization
same areas as in UC-6 =>
parts of Germany, Austria
and Italy.

2018 as reference year for
regression between VHR
and S1/S2.



Use Case 8: Fractional Canopy Cover



eurac
research

Added Capabilities:

1. Access to additional data from external providers
2. Co-registration of VHR to S1 & S2 ARD
3. Sample Canopy Detection in VHR
4. Downscaling
5. Regression Models
6. Validation of such models
7. Derivation of FCC maps and
8. Uncertainty

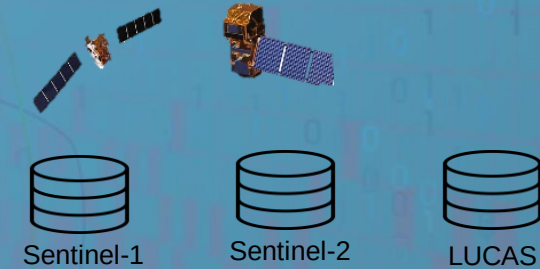
Demonstration:

- Apply (1), (2) and (3) on VHR
- Link S1 & S2 indices with VHR using (4)
- Regional scale test based on areas of UC-6
- Visualization of (6) and (7) in interactive map.

Use Case 9: Dynamic Large Area Land Cover

2018 EUROSTAT LUCAS for reference of at least 13 classes in Europe:

- Broadleaved Woodland
- Coniferous Woodland
- Mixed Woodland
- Shrubland
- Grassland
- Cropland
- Bare Land
- Lichens and Moss
- Built-up
- Inland Water
- Sea and Ocean
- Glaciers and Snow
- Wetlands



Use Case 9: Dynamic Large Area Land Cover

Added Capabilities:

1. Pixel based time series metrics
2. Training data extraction
3. Validation data extraction
4. Rasterization of ancillary data
5. Parametrize machine learning models
6. Prediction based on those models
7. Accuracy Assessment

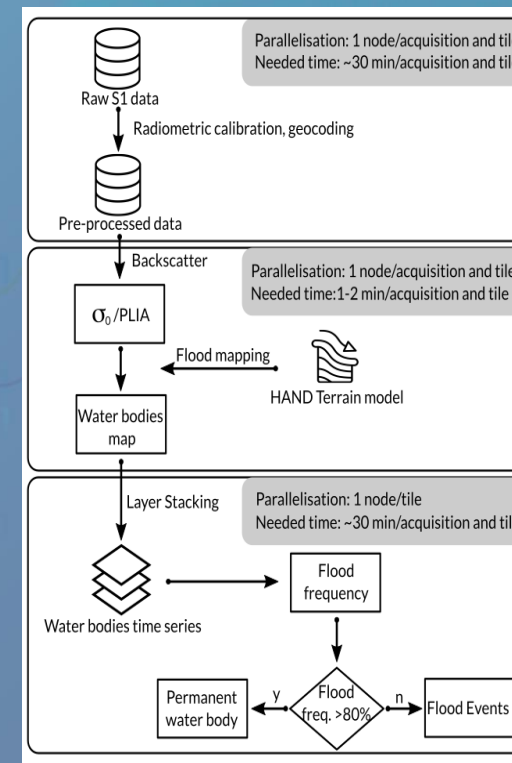
Demonstration:

- 10m Feature generation using S1 & S2 based on (1)
- User specified legend for extraction of (2) and (3)
- Customizable ML model (5) (e.g. RF)
- Results showcased over smaller areas
- Parallelization on larger areas

Use Case 11: Flood Risk Zone Mapping

Objectives and Demonstration:

1. Map flood frequency for risk zone mapping
2. Transform existing chain from TU Vienna into openEO compatible form
3. Integrate existing data into data cube services of openEO platform
4. Apply for the years 2016-2018 in
 - Austria
 - Northern Italy Po River Basin
 - Danube Region over 9 countries



Use Case 2: Vessel Detection

Objectives and Demonstration:

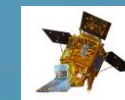
1. Detect Maritime Vessels
2. Detect patterns of spatial and temporal movements
3. Link EO data with terrestrial AIS data
4. Interactive visualization of (1) and (2)
5. Apply to area ->
6. For one complete year (2018 or later)
7. Validation with AIS



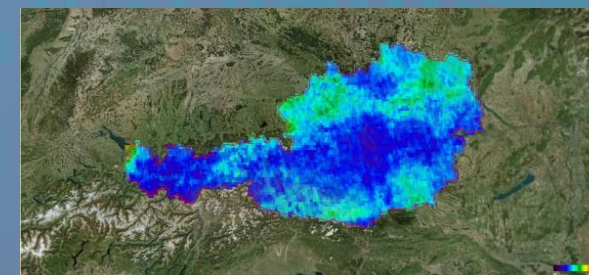
Use Case 4: NO₂ Monitoring

Objectives and Demonstration:

1. Monitoring and visualization of NO₂ levels on global scale
2. Temporal re-sampling for cloud cover elimination
3. Spatial re-sampling for data reduction on global scale
4. Interactive visualization tools
 - Color coding of maps
 - including time animations
 - Graph comparisons



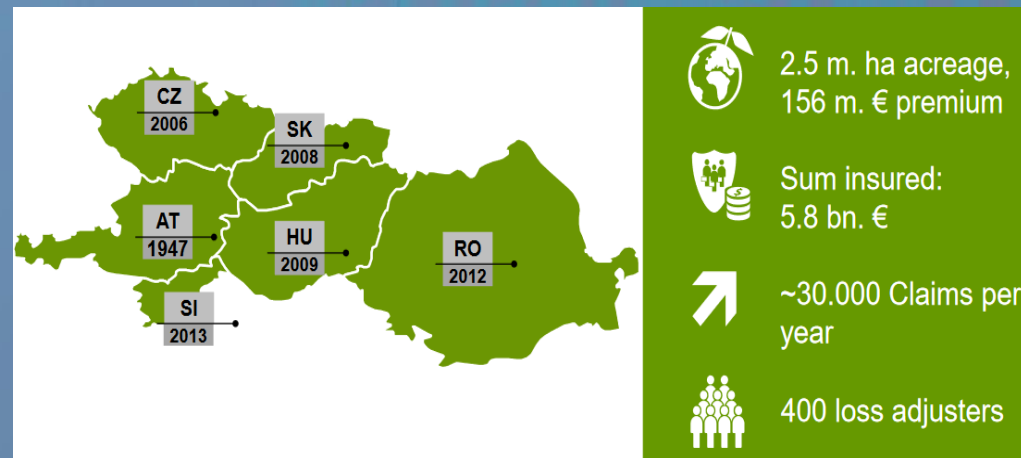
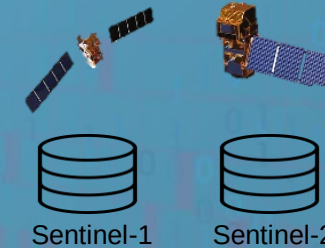
Sentinel-5p



Use Case 15: Crop Conditions

Objectives and Demonstration:

1. Map insurance relevant information on Crop Conditions with VI from S1 and S2
2. Integrate with information from UC-3 and UC-9
3. Apply in test site located in
 - Austria
 - Czech Republic
 - Slovakia
 - Slovenia
 - Hungary
 - Romania



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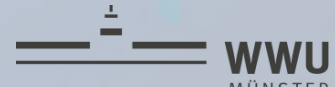
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UC 11: Flood Risk

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UC4: NO₂

1. Connection & login to openEO instances
2. Optical time series with different atmospheric correction
3. Optical resolution merge
4. SAR time series with different backscatter generators



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June 2021
Thank you for the attention