Hungarian Space Office

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→ 7th ADVANCED TRAINING COURSE ON LAND REMOTE SENSING

4–9 September 2017 | Szent István University | Gödöllő, Hungary

Hungarian Space Office

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SeNtinel Application Platform
&
Scientific Toolbox Exploitation Platform

Fabrizio Ramoino [SERCO c/o ESA-ESRIN]

SNAP/STEP

SNAP Overview

The common architecture for all Sentinel Toolboxes and SMOS Toolbox is called Sentinel Application Platform (SNAP). SNAP architecture is ideal for Earth Observation processing and analysis due the following technological innovations: Extensibility, Portability, Modular Rich Client Platform, Generic EO Data Abstraction, Tiled Memory Management and a Graph Processing Framework.

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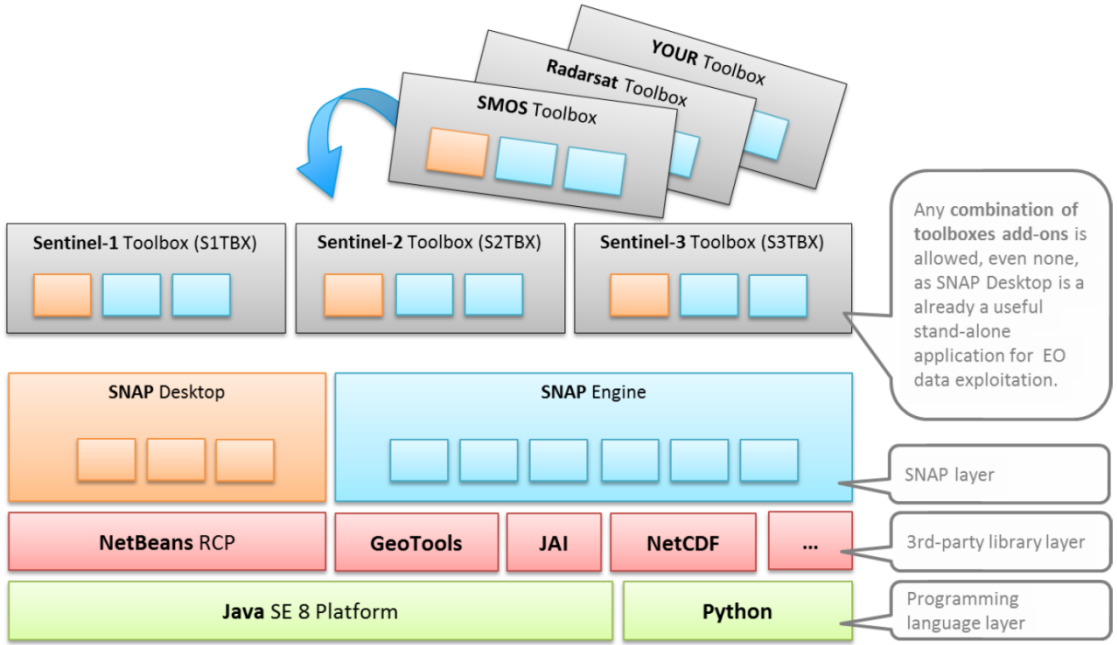
SNAP/STEP
SNAP Benefits

- ✓ *Developed as open source software*
- ✓ *Common Java core framework*
- ✓ *Joint development plan for Sentinel toolboxes*
- ✓ *Interchangeable Java/Python plugins*
- ✓ *Portable engine to Cloud infrastructure*
- ✓ *Single installer*



NetBeans github GPL Free as in Freedom Java

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SNAP/STEP

SNAP Free & Open Source

✓*Freely downloadable in* ***http://step.esa.int/main/download***

"Free as in Freedom"

✓*Run it anywhere you want*

✓*Make copies*

✓*Distribute it*

✓*Study the code*

✓*Change it, Improve it, Distribute your modifications*

SNAP/STEP

SNAP Cardinal Requirements

SNAP, the common architecture for all Sentinel Toolboxes, is ideal for EO data processing and analysis due the following technological innovations

✓Extensibility

✓Portability

✓Modular Rich Client Platform

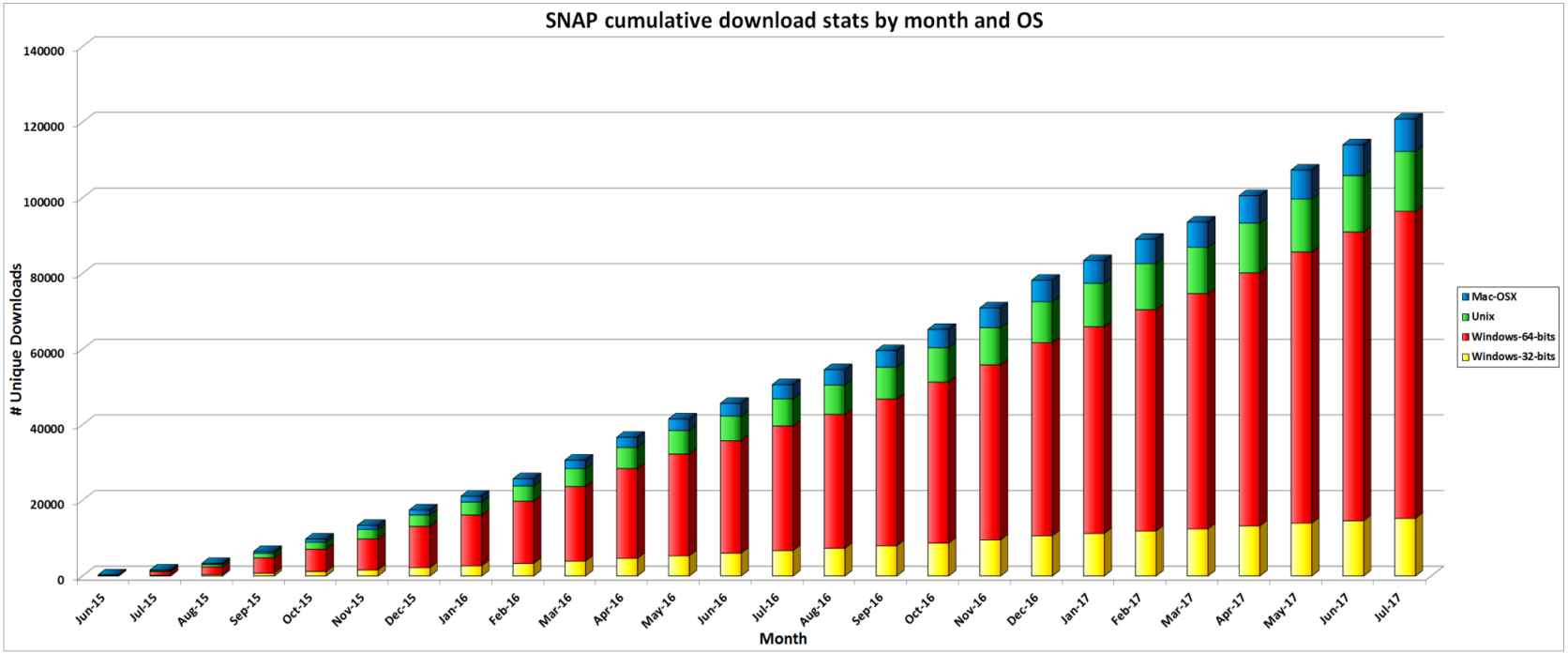
✓Generic EO Data Abstraction

✓Tiled Memory Management

✓Graph Processing Framework

SNAP/STEP

SNAP Download Statistics



SNAP download exceeded 120.000 from June 2015 until today

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SNAP/STEP

STEP Overview

Science Toolbox Exploitation Platform (STEP) is the ESA community platform for accessing the software and its documentation, communicating with the developers, dialoguing within the science community, promoting results and achievements as well as providing tutorials and material for training scientists using the Toolboxes.

step.esa.int

Come and tell us:

- ✓ *What you need?*
- ✓ *How/for what you use it?*
- ✓ *Describe your use cases, showcase your results: we are happy to publish them on STEP Gallery*

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SNAP/STEP

STEP Rational & Benefits

- ✓ *Evolving towards EO Science 2.0*
- ✓ *Using state of the art technology*
- ✓ *Gathering user feedback*
- ✓ *Having a forum*
- ✓ *Providing statistics*
- ✓ *Animating the community*
- ✓ *Facilitating the open source benefit and approach*
- ✓ *Raising the profile of the STBX*
- ✓ *Communicating on results*
- ✓ *Showcasing examples imagery (with S1 and then S2)*

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SNAP/STEP

STEP Community

A number of resources are available for end users and developers to get their hands on SNAP and the Sentinel Toolboxes.

Forum *- is maintained by the Sentinel Toolboxes project teams who will answer your questions, if not done by other community members. Collaborate, share your knowledge and learn from other users.*

Blog *- here you will find the latest news about SNAP and the Sentinel Toolboxes software.*

Stay tuned!

Developers *- As an open source software, the maintainers of SNAP and the Sentinel Toolboxes welcome code contribution and bug fixes.*

Issue Reporting *- You just found a bug? Or maybe you want to report about this excellent idea you just had for a future release? We welcome reports for issues and feature requests.*

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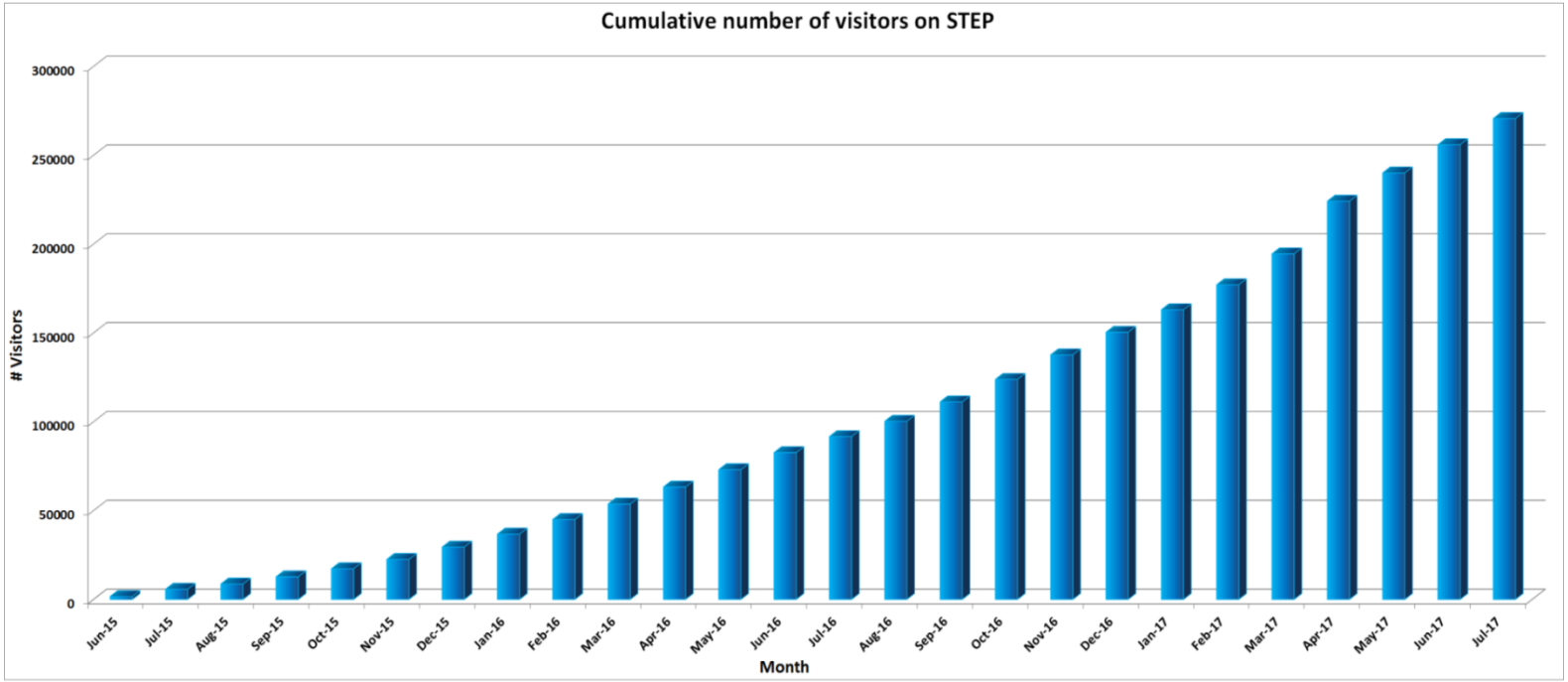
SNAP/STEP

STEP Statistics



STEP website reached more than 270.000 visit sessions from June 2015 until today

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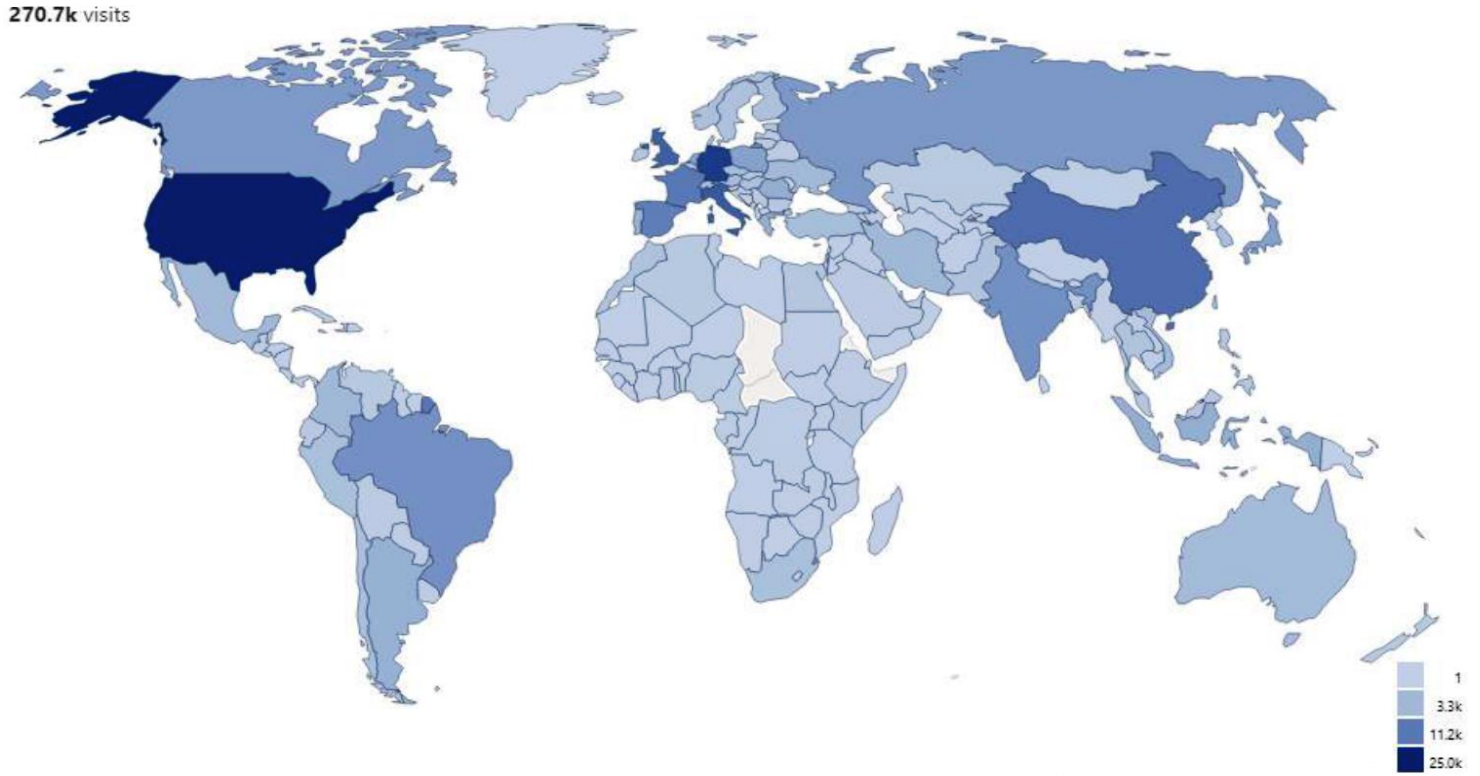
SNAP/STEP

STEP Statistics



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Sentinel-2 Toolbox
Fabrizio Ramoino [SERCO c/o ESA-ESRIN]

Sentinel-2 Toolbox

Overview

The SNAP extension for HR data

Sentinel-2 data readers: L1B, L1C, L2A

Multi-mission: new land-products readers

- ✓ *Landsat, Spot 1-7, RapidEye, Deimos*
- ✓ *More to come in the future: UK-DMC, Ingenio/SEOSAT, EnMAP*

Sentinel-2 oriented scientific processors

- ✓ *Sen2Cor: Atmospheric correction for S2-MSI L1C*
- ✓ *Sen2Three: multi-temporal synthesis of L1C/L2A*
- ✓ *L2B processor: biophysical products from L2A*
- ✓ *Radiometric Indices*
- ✓ *Water processors (FLH/MCI)*
- ✓ *Deforestation detection processor*

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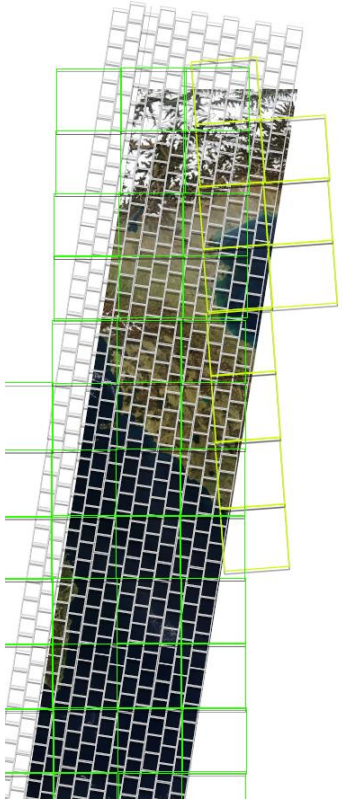
Sentinel-2 Toolbox

Sentinel-2 Reader



- ✓ *Optimized multi-resolution viewing/processing*
- ✓ *JPEG2000 decoding through OpenJPEG library*
- ✓ *Internal cache of JP2 decoded tiles for performance*

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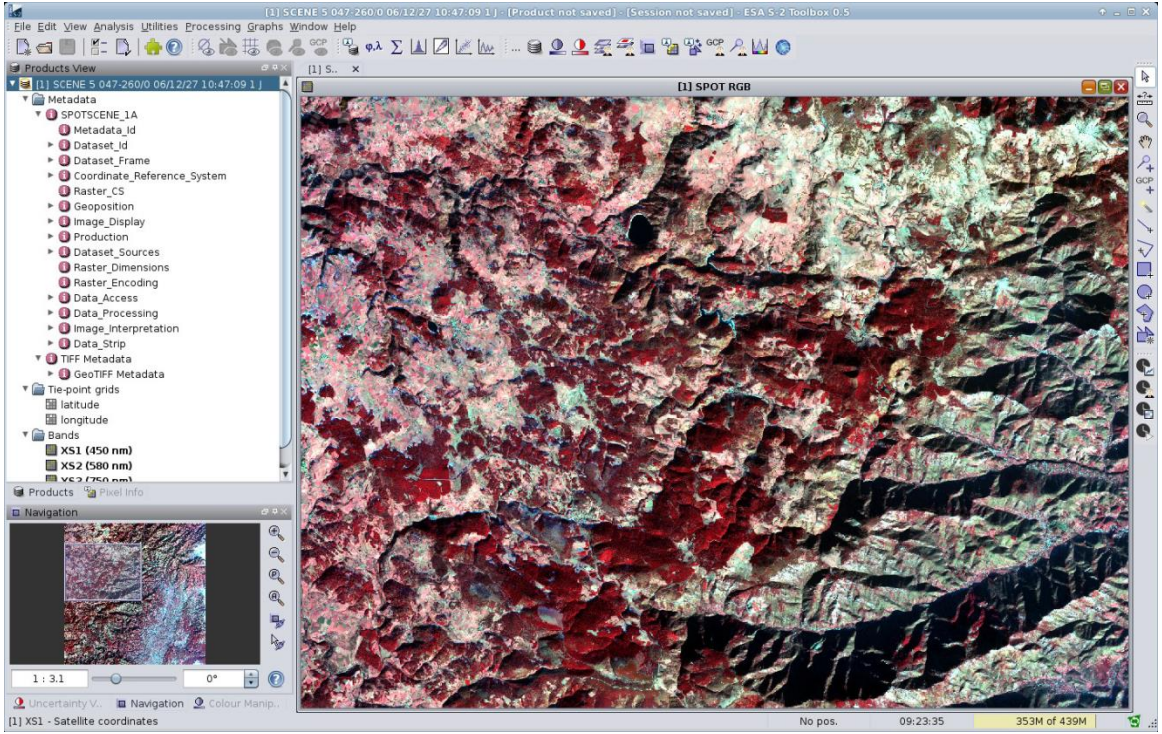
Sentinel-2 Toolbox

New Land-Oriented Products Reader

- ✓ *Landsat*
- ✓ *SPOT 1-7*
- ✓ *RapidEye L1B/L3A*
- ✓ *Deimos*
- ✓ *SPOT4/5 Take5*
- ✓ *ALOS AVNIR*
- ✓ *…*



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Sentinel-2 Toolbox

Level-2A Processor – Sen2Cor

BOA reflectance in cartographic projection developed by Telespazio Vega

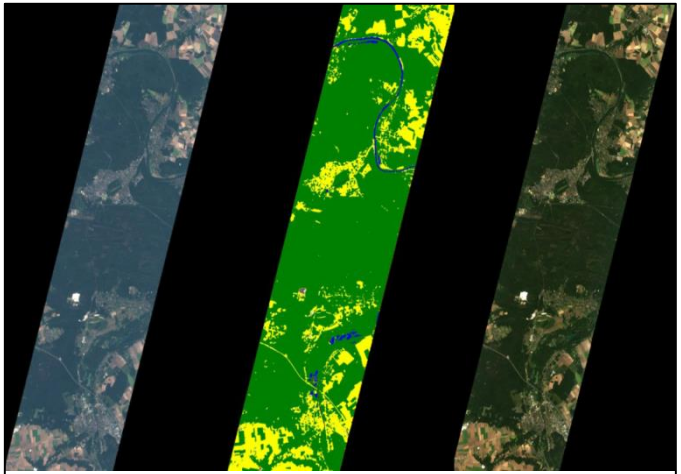
Integration in SNAP via the Standalone Tool Adapter

Additional data

- ✓ *Scene Classification Map*
- ✓ *Water Vapour Map*
- ✓ *Aerosols Optical Thickness Map*

Algorithm

- ✓ *Cloud/Cloud shadow detection*
- ✓ *Cirrus correction*
- ✓ *Slope effect correction*
- ✓ *BRDF effect correction*



L1C *Classification* *L2A*

- ✓ *Seamless integration in SNAP*
- ✓ *GUI provided*
- ✓ *Level-2A product reader*

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Sentinel-2 Toolbox

Level-2B Processor – Biophysical Products

Automatic generation of L2B products from L1C/L2A

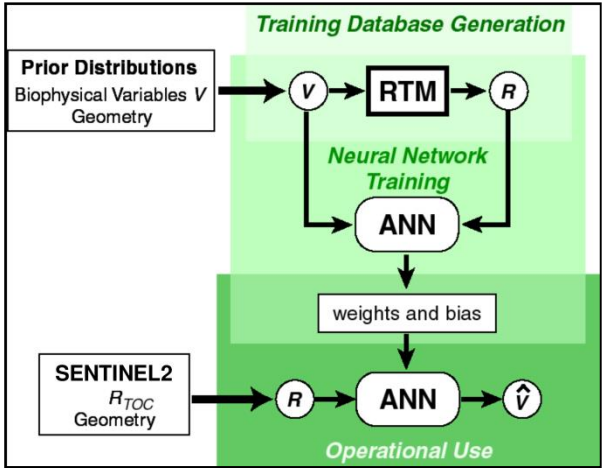
LAI *- Leaf Area Index*

fAPAR *- fraction of photosynthetically active radiation absorbed by the green elements of the canopy*

FVC *- the Cover Fraction, used to separate vegetation and soil in energy balance process*

CCC *- the Canopy Chlorophyll Content, good indicator of stresses including nitrogen deficiencies*

CWC *- the Canopy Water Content used also as a proxy for the water status of the plant*



Algorithm developed by INRA

Sentinel-2 Toolbox

LAI – Amazon Forest

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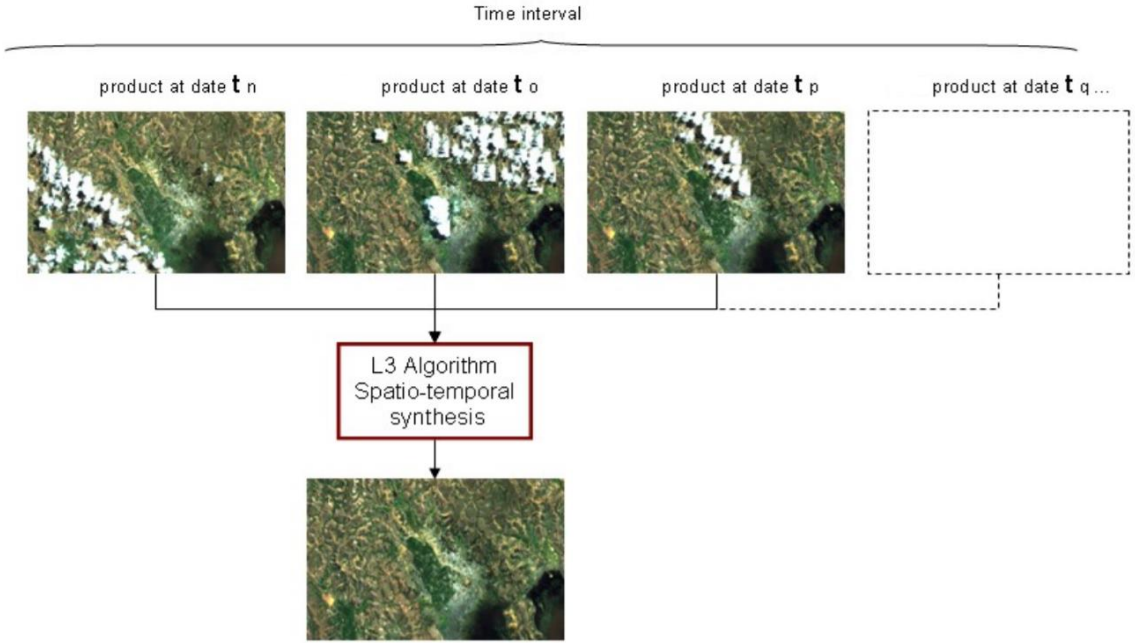
Sentinel-2 Toolbox

Level-3 Processor – Sen2Three

Multi-temporal cloud-free composites generation from Sentinel-2 data



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Sentinel-2 Toolbox

Radiometric Indices Processor – Sen2Rad

Radiometric indices are quantitative measures of features that are obtained by combining several spectral bands

Vegetation indices

- DVI, RVI, PVI
- NDVI, WDVI, TNDVI, GNDVI
- SAVI, TSAVI, MSAVI, MSAVI2
- GEMI
- ARVI
- NDI45
- MTCI, MCARI, PSSRa
- S2REP, REIP, IRECI

Soil indices

- BI
- BI2
- RI
- GEMI

Water indices

- NDWI
- NDWI2
- MNDWI
- NDPI
- NDTI

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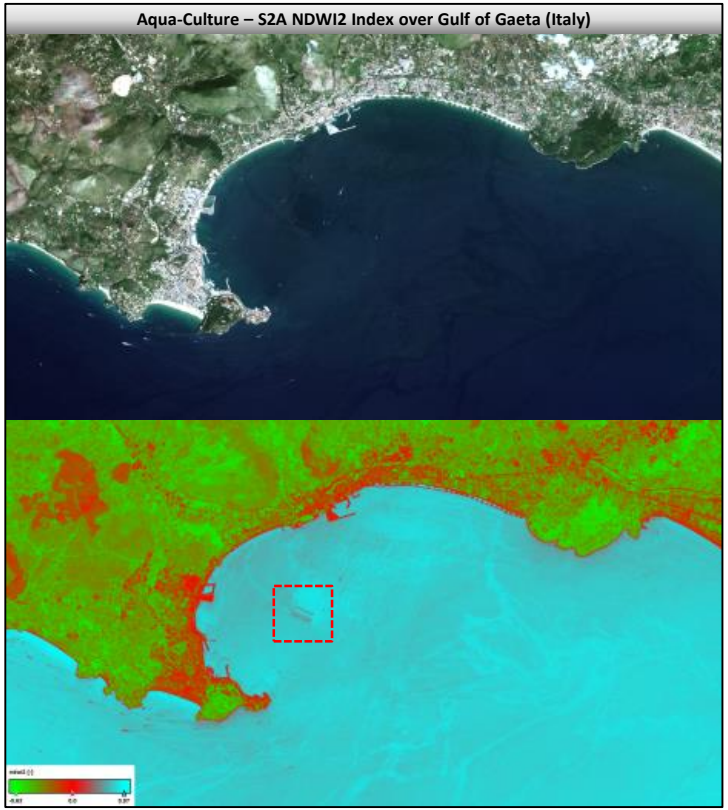
Sentinel-2 Toolbox

NDWI2 – Gulf of Gaeta



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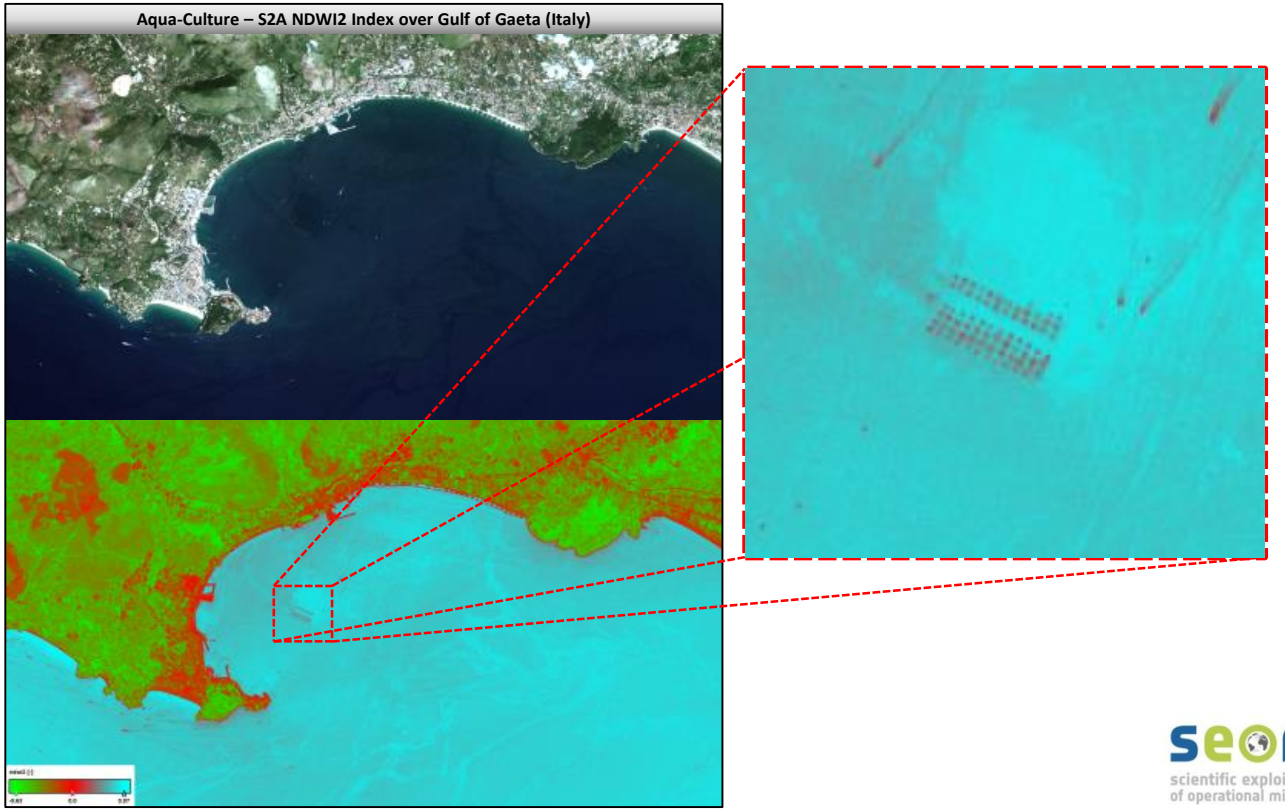
Sentinel-2 Toolbox

NDWI2 – Gulf of Gaeta



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Thank you