

living planet symposium | BONN

23–27 May
2022

TAKING THE PULSE
OF OUR PLANET FROM SPACE



SNAP (SeNtinel Application Platform)

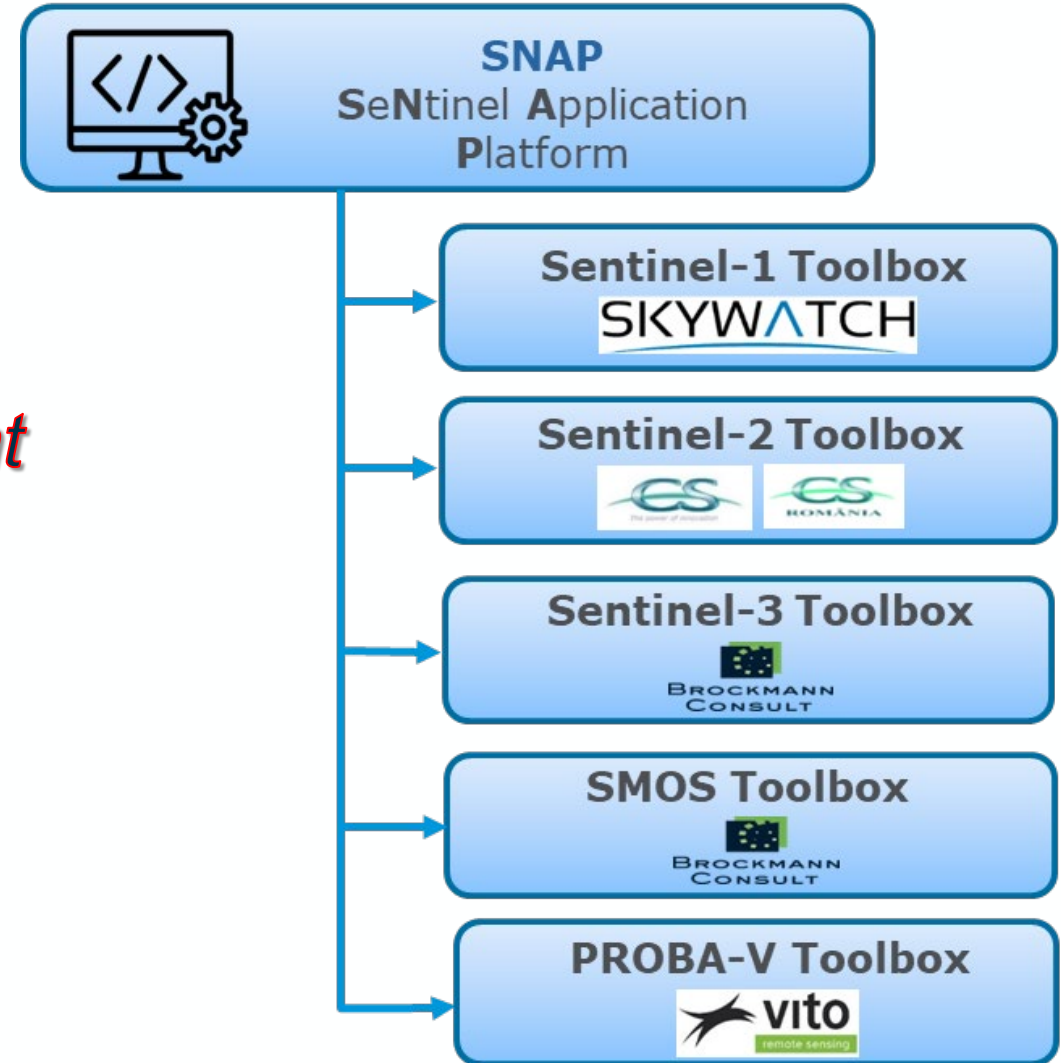
Marcus Engdahl, Fabrizio Ramoino, Marco Peters, Stephen Plummer,
Espen Volden

26.5.2022



Download it at
step.esa.int

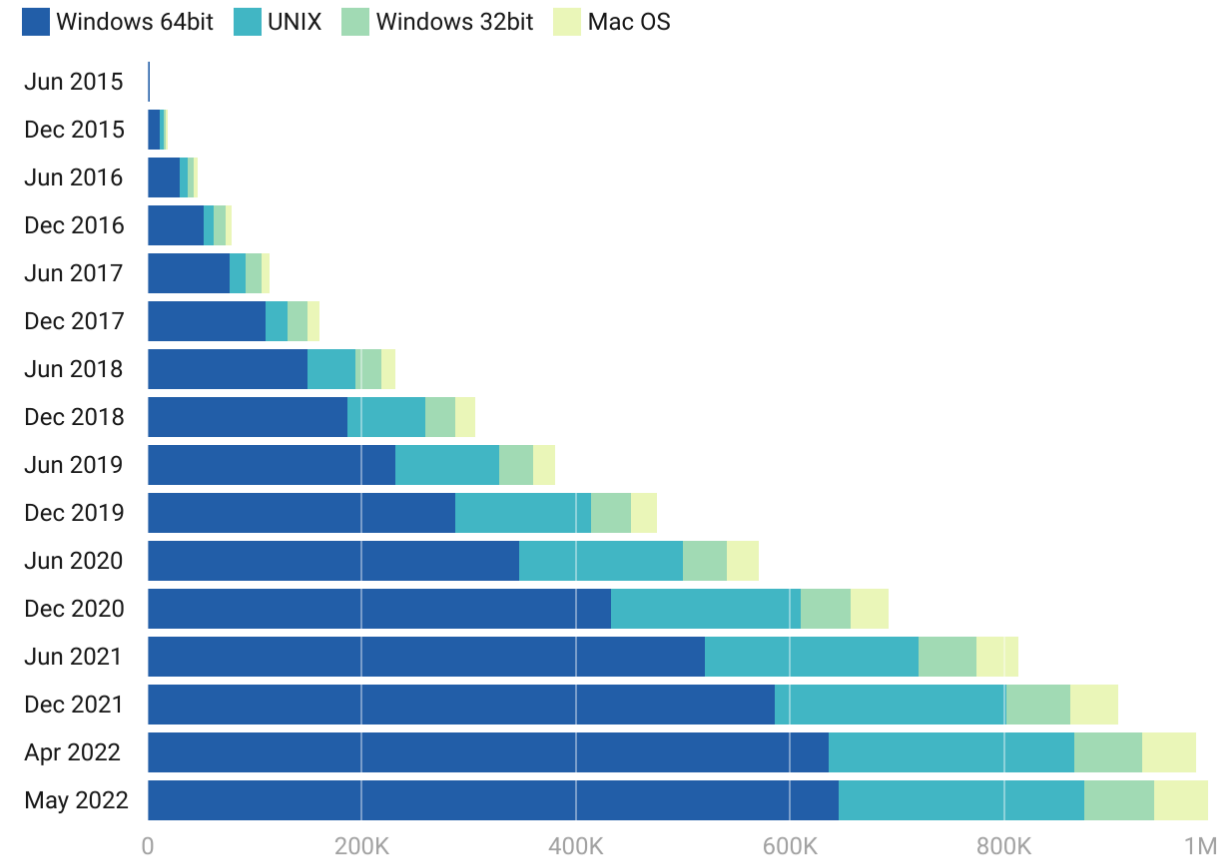
- ✓ Free and open source software (GPLv3)
- ✓ Supported by ESA in the long term
- ✓ Common Java core framework
- ✓ Interchangeable Java/Python plugins
- ✓ Portable engine – runs anywhere from laptops to data centers
- ✓ User friendly: single installation, intuitive GUI, online help, tutorials, active user forum



SNAP Adoption

- 1 million downloads breached during LPS week
- ~10000 people registered on forum
- Widely used globally in:
 - Teaching of Remote Sensing
 - Research & development
 - EO downstream industry

SNAP cumulative downloads



Downloads until 22 May

Chart: ESA • Created with Datawrapper

European Space Agency & national Space Agencies

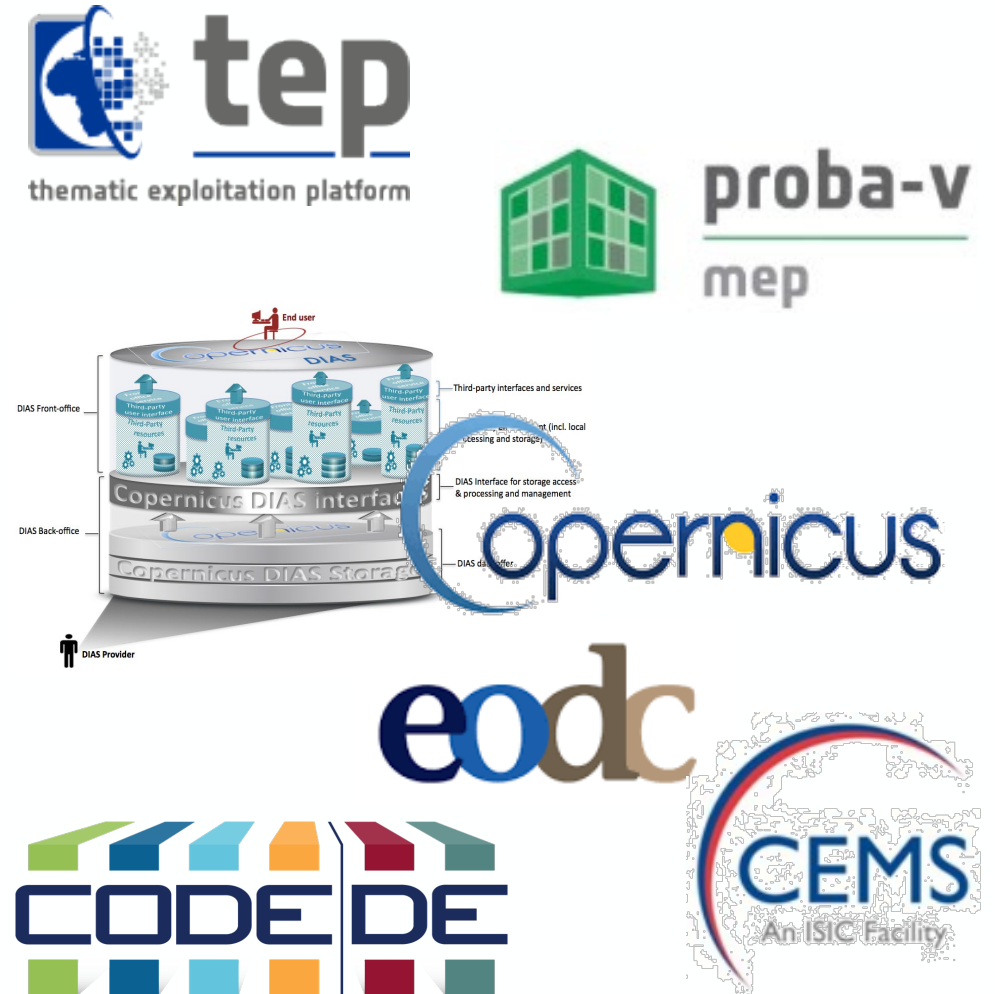
- Thematic Exploitation Platforms (TEPs),
- Mission Exploitation Platforms (e.g. Proba-V MEP)

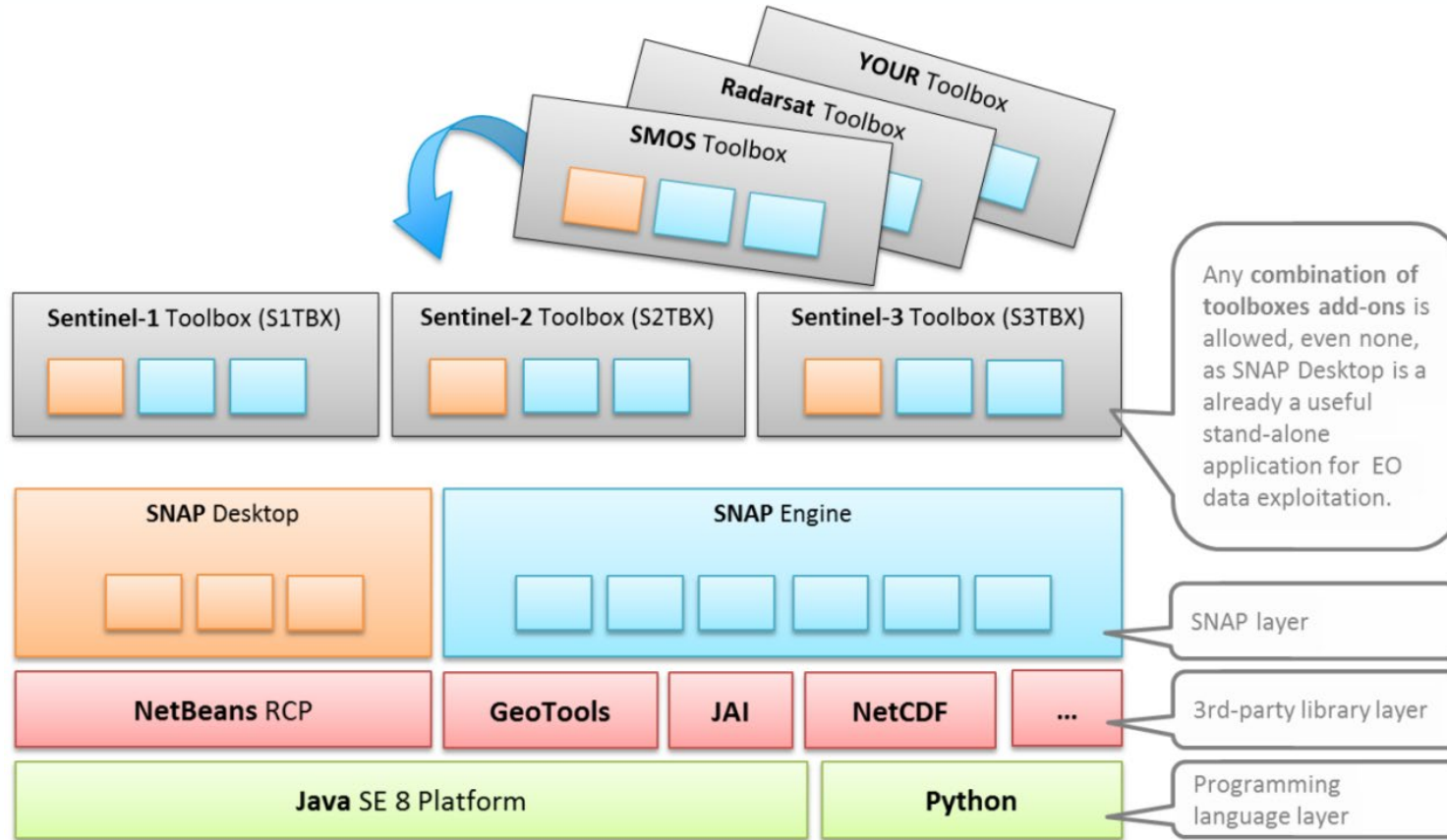
European Commission

- Copernicus Data and Information Access Services (DIAS)

Copernicus Collaborative Ground Segments

- CODE-DE,
- CEMS





SNAP & SAR Functionality

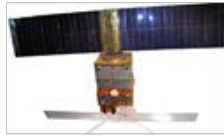
(Sentinel-1 Toolbox)



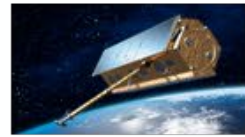
Sentinel-1



ENVISAT



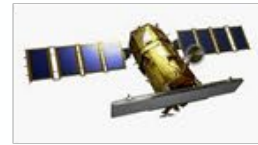
ERS-1



TerraSAR-X



RADARSAT



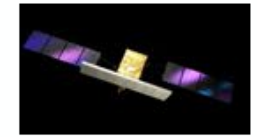
KOMPSAT-5



ALOS 1&2



ICEYE



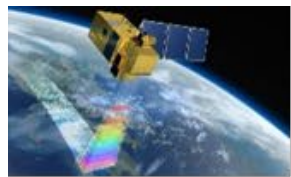
COSMO-SkyMed

Main features:

- ✓ Absolute calibration, Multilooking, Speckle filtering, Precise orbits handling
- ✓ Coregistration of detected and complex products
- ✓ Full support of Sentinel-1 TOPS interferometry, debursting, slice assembly
- ✓ Terrain Correction
- ✓ SAR simulation and Layover and shadow masks
- ✓ Applications: oil spill detection, ship detection, wind field estimation etc.
- ✓ Fully integrated and featured InSAR tools for Stripmap and Zero-Doppler focused data
- ✓ Compatibility with PolSARpro Toolbox (Reader, Writer)
- ✓ Integrated Export to SNAPHU (interferometric phase unwrapping) and STAMPS (PS InSAR)

SNAP & Optical HR Functionality

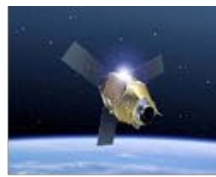
(Sentinel-2 Toolbox)



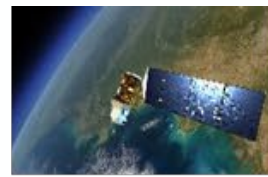
Sentinel-2



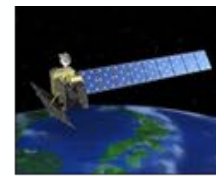
SPOT



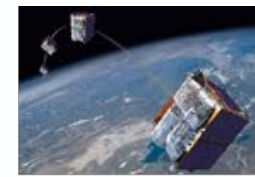
Pleiades



Landsat



ALOS AVNIR



RapidEye



Kompsat



Ikonos



Worldview

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Main features:

- **Sen2Cor** and **i-Cor** for Atmospheric Correction
- **L2B biophysical processor** (LAI, fAPAR, ...)
- Reflectance to Radiance Processor
- **Radiometric Indices**
 - ✓ **Vegetation indices:** DVI, RVI, PVI, IPVI, WDV, TNDVI, GNDVI, GEMI, ARVI, NDI45, MTCI, MCARI, REIP, S2REP, IRECI, PSSRa
 - ✓ **Soil indices:** SAVI, TSAVI, MSAVI, MSAVI2, BI, BI2, RI, CI
 - ✓ **Water indices:** NDWI, NDWI2, MNDWI, NDPI, NDTI
- **IdePix Processor:** pixel classification
- **OTB tools:** Pansharping, Rasterization, Segmentation, ...

SNAP & Optical/Thermal MR Functionality

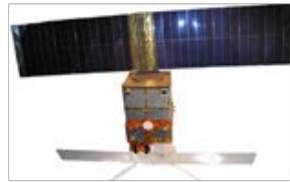
(Sentinel-3 Toolbox)



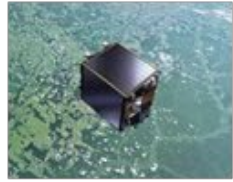
Sentinel-3



ENVISAT



ERS



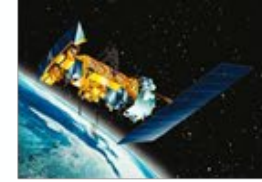
Proba-V



SPOT VGT



MODIS



AVHRR



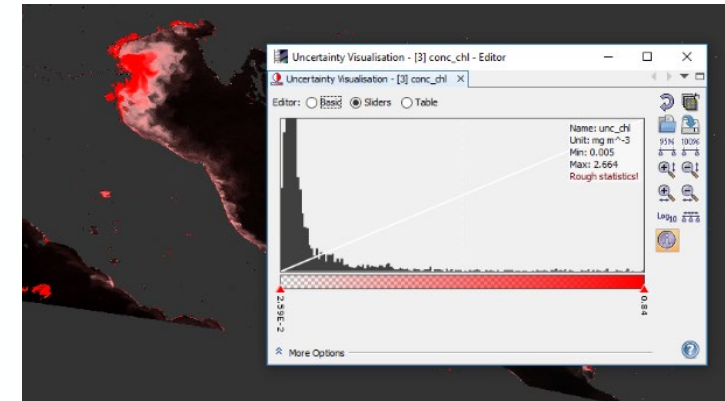
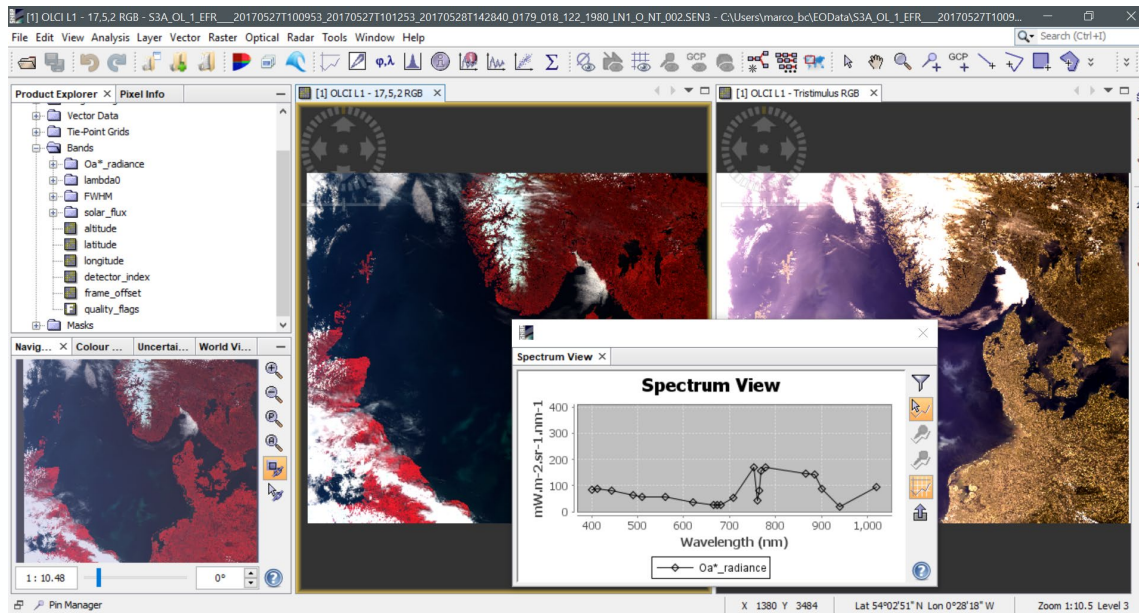
VIIRS

.....

Main features:

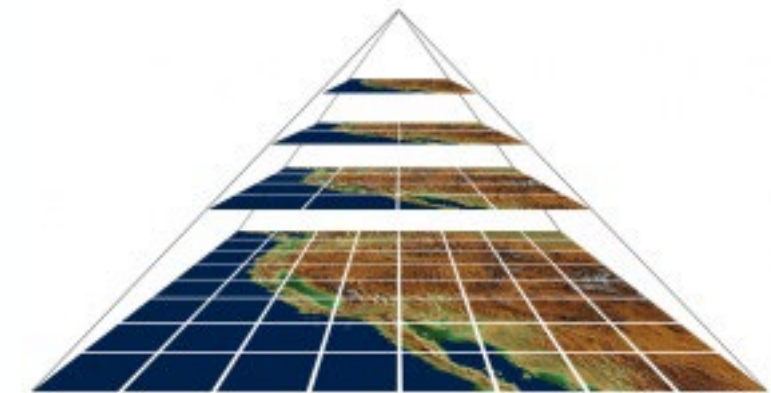
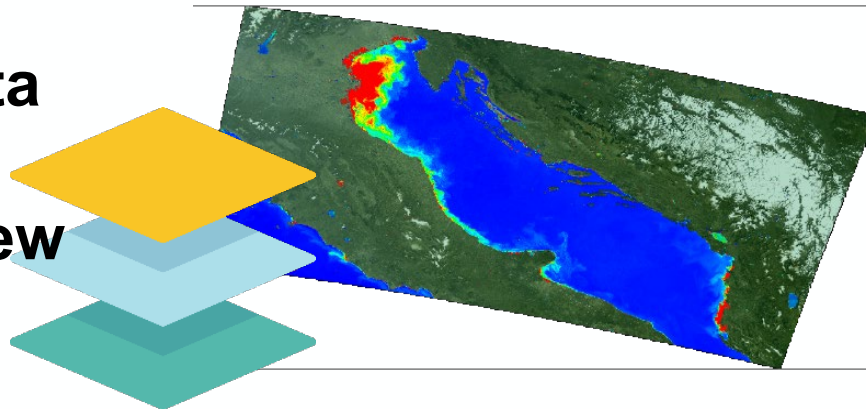
- Visualizing spectrum of pixels
- **Uncertainty** visualization and propagation of uncertainty in BandMaths
- Pixel extraction tool
- Specific sensor processors:
 - ✓ *S3 OLCI Radiometry, S3 SLSTR PDU stitching*
 - ✓ *AATSR/SLSTR Regridding*
 - ✓ *Performs radiometric corrections on MERIS*
- Optical water type classification based on atmospherically corrected reflectances
- FU (Forel-Ule) Classification used to derive the hue angle and FU value
- **IdePix Processor:** pixel classification
- FLH (Fluorescence Line Height) / MCI (Maximum Chlorophyll Index) retrieval
- Case-2 C2RCC water processor
- MERIS FUB-CSIRO Coastal Water Processor

Using SNAP (on the Desktop)



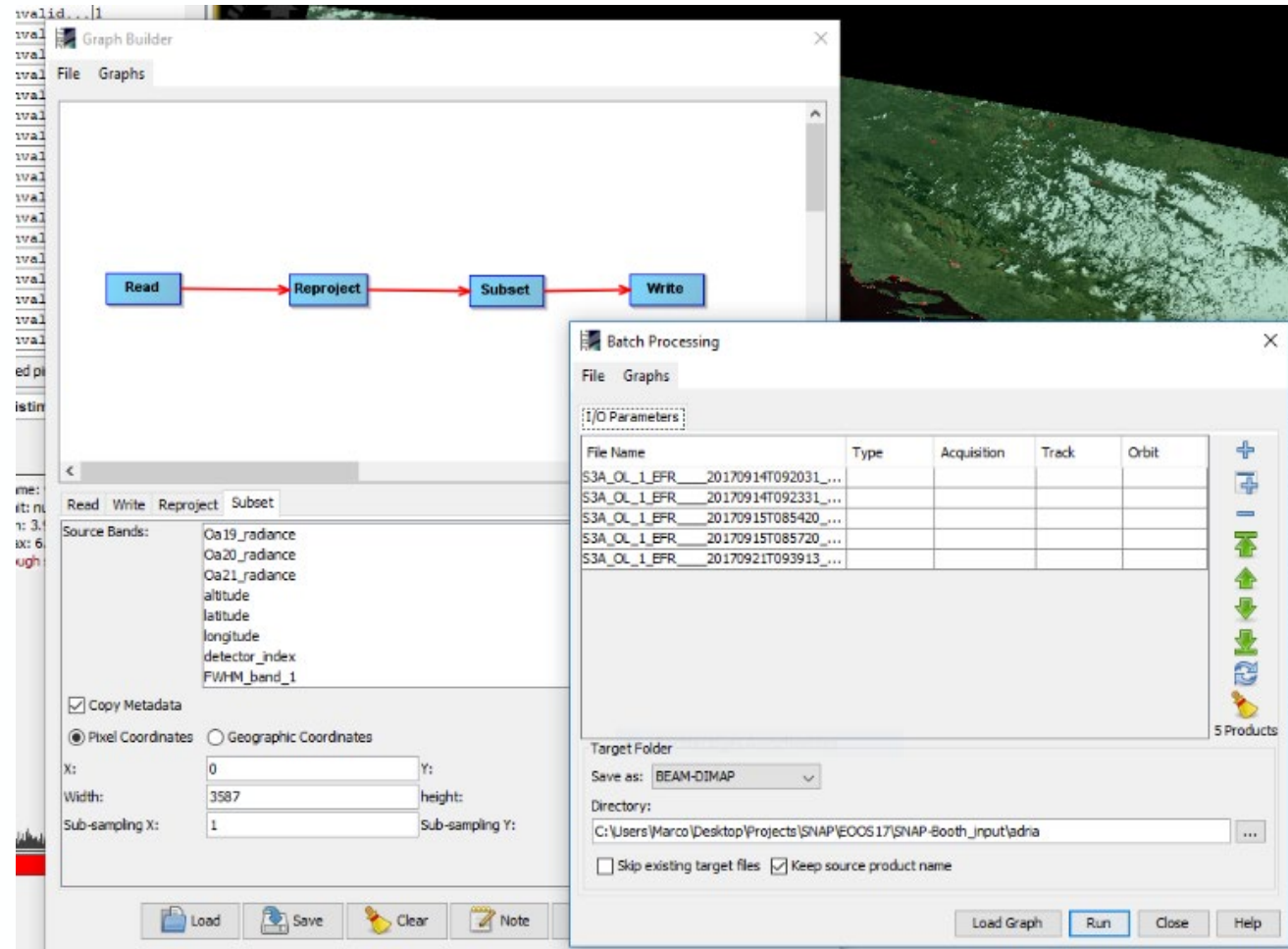
**Display
uncertainty
information**

**Layer data
sources
in one view**



**Fast visualisation by
tiled image pyramids**

Using SNAP (GUI processing)



Batch processing within the GUI


```
SNAP Command-Line - gpt G:\EOData\_graphXML\olci_vicarious_c2rcc.xml -p G:\EOD...  
Welcome to the SNAP command-line interface.  
The following command-line tools are available:  
gpt          - Graph Processing Tool  
pconvert     - Data product conversion and quicklook generation  
snap64       - SNAP Desktop launcher  
snappy-conf  - Configuration tool for the SNAP-Python interface  
Typing the name of each tool will output its usage information.  
  
> gpt G:\EOData\_graphXML\olci_vicarious_c2rcc.xml -p G:\EOData\_graphXML\vic  
arious.properties -t "G:\EOData\temp\vicarious_c2rcc.dim" "G:\EOData\SENTINEL  
3\OLCI\S3A_OL_1_EFR____20190214T070944_20190214T071244_20190215T112348_0179_0  
41_220_2160_LN1_O_NT_002.SEN3"  
INFO: org.esa.snap.core.gpf.operators.tooladapter.ToolAdapterIO: Initializing  
external tool adapters  
Executing processing graph  
INFO: org.hsqldb.persist.Logger: dataFileCache open start  
....10%....20%....30%....40%..
```

**Powerful data processing via the
Command Line Interface**

```
source = ProductIO.readProduct('G:/EoData/S3/S3A_OL_1_EFR____20200216T101647_..._2160_LN1_0_NT_002.SEN3')

parameters = HashMap()
parameters.put('salinity', 32)
parameters.put('temperature', 10.3)
parameters.put('outputAsRrs', True)
result1 = GPF.createProduct('c2rcc.olci', parameters, source)
parameters = HashMap()
parameters.put('crs', 'EPSG:4326')
result2 = GPF.createProduct('reproject', parameters, result1)

ProductIO.writeProduct(result2, 'G:/EoData/temp/S3A_OL_1_EFR____20200216T101647_C2RCC_WGS84.dim')
```

Use Java or Python to implement your own processing steps or to script the processing of your data

SNAP features:

- Introducing new ZNAP data format
Smaller footprint on disk, faster writing, and it uses a single file or directory; It is Zarr based and can easily be read with Python/Xarray
- Support for the high-resolution Copernicus DEM
- Improved Colour Manipulation Tool, e.g., auto-applied colour schemes based on band-name

S1TBX features:

- S1 ARD functionality enhanced with the addition of a Noise Power Image and Gamma-to-Sigma ratio image
- Support for SAR missions Cosmo-Skymed SG, Gaofen-3 and Spacety

S2TBX features:

- Added new plugins adapter for MAJA and Sen2Cor tools
- Added windowed reading of products in Graph Builder

S3TBX features:

- New pre-processing operators for Sentinel-3 data. The OLCI Anomaly Detection operator, and operator for harmonising OLCI A and B data
- OLCI L2 Land and Water products contain masks recommended by the QWG

2022-2024:

- New functionality & support of new sensors
- Official Docker images
- Official Python-wrapper (snapista)
- Processing throughput improvements (optimisation of tile-processing)
- Full adoption of three-tier architecture
- Review of codebase & help + tutorials

Longer term evolution of SNAP 2024+ (ideas)

- SNAP as a cloud-service
- webSNAP in browser
- Language-agnostic processing-chains.

Thank you!



Download SNAP

<https://step.esa.int/main/toolboxes/snap/>

STEP Discussion Forum

<https://forum.step.esa.int/>

Please participate in SNAP User Survey!

