

→ THE ESA EARTH OBSERVATION Φ -WEEK

EO Open Science and FutureEO

12–16 November 2018 | ESA–ESRIN | Frascati (Rome), Italy

SNAP as collaborative research and exchange platform

15/11/2018

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- Exploration of EO data
- Generic & instrument specific tools
- Bulk processing tools
- Extendable by everyone
- Active community
- User driven development
- Long term support warranty





Funded by CSA



Funded by Vito

**... To be continued
by you?**

GIVE & TAKE

Exchange

One STEP further

<https://step.esa.int>









The screenshot shows the homepage of the STEP (Science Toolbox Exploitation Platform) website. The header features the ESA logo and the text "step science toolbox exploitation platform". A navigation menu includes links for "ESA", "STEP", "TOOLBOXES", "DOWNLOAD", "GALLERY", "DOCUMENTATION", "COMMUNITY", and "THIRD PARTY PLUGINS". A search bar is located in the top right corner. The main content area is titled "Home > Scientific Toolbox Exploitation Platform" and features a large banner for "multimission scientific toolboxes" with an image of a satellite. Below the banner, there is a paragraph of text explaining that ESA is developing free open-source toolboxes for the scientific exploitation of Earth Observation missions under the SEOM (Scientific Exploitation of Operational Missions) programme element. It states that STEP is the ESA community platform for accessing the software and its documentation, communicating with developers, and providing tutorials and material for training scientists. A sidebar on the left lists various toolboxes: SNAP, Sentinel 1 Toolbox, Sentinel 2 Toolbox, Sentinel-3 Toolbox, SHOS Toolbox, Proba-V Toolbox, Download, Community, and Useful Links. A small "SNAP SURVEY" icon is also visible. On the right side, there is a "seom" logo and a "2018" section with a thumbnail for "Mapping Urban Areas from Space (MAUS 2018)" and a reference to "EO Open Science 2018".

Tutorials

<https://step.esa.int>

SELECTED: SNAP [1 to 12 / 16] Sort By (Tutorial Name) ▲

 <p>Analysis Tools: Statistics and Profile Plot December 29, 2015 Introduction to the statistics diagrams and the profile plot tool.</p>	 <p>Band Math January 19, 2016 Walkthrough with the operation of adding a new band to a product opened in SNAP.</p>
 <p>Bulk Processing from the Command Line June 25, 2018 Describes by an example how bulk processing can be done from the command line with gpt.</p>	 <p>Compute NDVI January 19, 2016 How to compute and interpret the results of the NDVI SNAP operator.</p>
 <p>Colour Manipulation Tool</p>	 <p>Create a GPF Graph by hand June 25, 2018 Shows how you can create graph XML files for execution with gpt on the command line.</p>

6th Advanced Land Training Course

2017

EO Open Science 2017

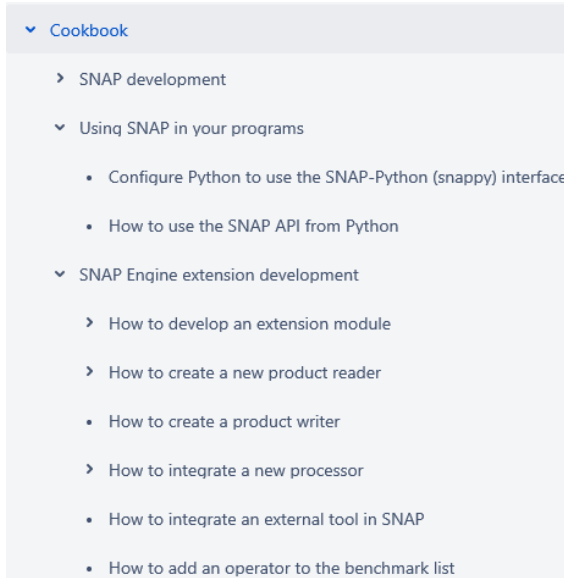
7th Advanced Land Training Course

ESA POLiNSAR 2017 Workshop

2016

Documentation

<https://step.esa.int>



How to

- use SNAP from Python
- configure snappy
- create new product reader
- implement a new processor

Documentation

<https://step.esa.int>

▼ User Guide

▼ Installation and Configuration

- Install a Plugin (.nbm file) via Plugin Manager
- Install a Toolbox via Plugin Manager
- Install SNAP on the command line
- › SNAP Configuration
- Starting multiple SNAP instances
- Update SNAP from the command line

▼ Processing

- Bulk Processing with GPT
- Creating a GPF Graph

How to

- install plugin file
- start multiple SNAP instance
- update SNAP from command line
- do bulk processing with GPT

Exchange Knowledge in STEP Forum

Forum

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

Stats:

New Users	180 / Month
New Threads	170 / Month
New Posts	1200 / Month
Active users	20 / Day
Users	4750

All Time ▾

Topic	Category	Users	Replies	Views
SEN2COR tool	sen2cor		227	25.7k
How to prepare Sentinel-1 images stack for PSI/SBAS in SNAP 5	StairPS		737	23.5k
SNAPHU Unwrapping	Interferometry		287	23.1k
Workflow between SNAP and StairPS	StairPS		327	16.6k
Sen2Cor 2.4.0, Stand-Alone Installers, How To Install	sen2cor		77	14.2k
Sentinel-1A GRD product	s1bfe		50	11.5k
Error: Cannot construct DataBuffer	snappy		54	11.1k
Supervised and unsupervised classification, Sentinel 2	s2bts		84	10.2k
Handling sentinel data in python (working with snappy)	python		52	9.6k
DEM generation	s1bfe		104	9.6k

step forum Using SNAP on Amazon Web Services

25 DAYS LATER



The tutorial posted by @weegdahl is a good start, in fact it is quite comfortable to handle SNAP on an AWS instance. My recommendations concerning this topic are:

- select an Ubuntu server as Instance
- in an optimal case, you have a prepared docker to set up your machine, otherwise, install a Python 3.x or 2.x via Anaconda, install jpy, install snap, configure snap to talk with your Python installation (the same things you would do on your local machine)
- use a Ubuntu/unix based OS desktop machine as local operator in order to avoid X11 forwarding conflicts (happened to me when I worked with a team where Macs are used, so be aware of this possible problems), do not worry about the hardware of the local machine, it just has to enter the internet, an old laptop running Knoppix is an inexpensive solution...
- you can use SNAP via Python or gpt, however, if you want to use the GUI, cd to your snap/bin dir, I guess it should be something like this:

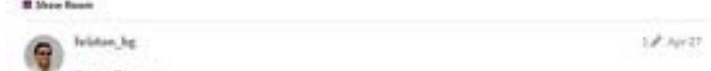
```
cd /home/user/snap/bin  
and call launch snap with  
sh snap
```

Now it depends on your internet connection how usable the GUI is, but my experience is, its quite good 😊

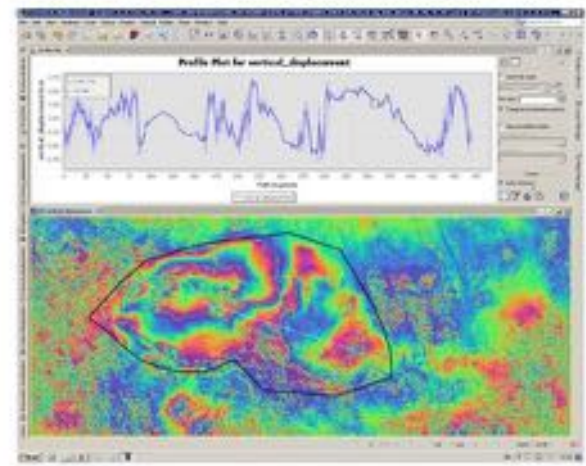
Which is very good explained in the asf tutorial is the handling of the input and output data, for a download after processing.

<https://forum.step.esa.int/t/using-snap-on-amazon-web-services/5867/4>

Nice interferogram from landslide near Anagriri village, Greece



Dear colleagues,
I'd like to share some good results obtained after creation of interferogram for a landslide event. In this case SNAP did perfect job.



In the upper part is the profile plot taken by the white line. The black shape corresponds roughly to the shape of the area of the Igriite mine where the event happened. Just for clarification - I had to downgrade SNAP to ver 3.0 in order to make the interferograms with ver 6.0 I got errors.

<https://forum.step.esa.int/t/nice-interferogram-from-landslide-near-anagriri-village-greece/9855>

Exchange Knowledge in STEP Forum



Workflow between SNAP and Stamps

142 / 328
Oct 2017

The screenshot shows a forum post with a satellite image of a forested area and a line graph showing data trends over time. The graph has a y-axis from -10 to 10 and an x-axis labeled 'Year (year)'. The data points are scattered around a central trend line that generally increases over time.

Can you share the latest experience to save time for people doing TS processing of S & S images using SNAP. Below is the short updated description flow - just these results.

STEP ITEMS
Tip: Use SNAP 6.8.1 beta (earlier versions have bugs in Topographic removal), usually impact results of each step to be sure everything is OK. Try a small subset first.

- 1) 3-4 images (split and apply Orbit File, split is done individually for each image because number of orbits covering the study area vary from image to image and you have to adjust the procedure manually, no batch processing can be used at this step. Apply orbit can be done using batch processing.
- 2) Create stack using Backgrounding (1) Radar Compensation (2) Top Compensation (3) Backgrounding. Master should be the first in the Product/Loaders. (4) 23 images are OK for each Stack, if more images in the Stack - it is better to split it into several Stacks each having the same master. Master can be chosen by Radar Compensation near Stack Overview.
- 3) Default the result of 2)
- 4) Make subset of the result of 3) (geographic coordinates) (Master Subset), Result file subset_master_Stack_Deb.
- 5) Apply Interferogram formation to the result of 4) - Result file subset_master_Stack_Deb_Img.
- 6) Apply Topographic removal to the result of 5) - Result file subset_master_Stack_Deb_Img_Without.
- 7) Add latitude band to the result of 6) - subset_master_Stack_Deb_Img_Without.
- 8) Do Terrain Correction (TC) of the two products: subset_master_Stack_Deb and subset_master_Stack_Deb_Img_Without (check boxes - output complex data and latitude/longitude when doing TC of subset_master_Stack_Deb), without TS results of Stamps may be disabled in a single step.
- 9) Export data for Stamps: Radar Interferometry: Follow Stamps export (connected to Stamps) the two files subset_master_Stack_Deb_Img_Without_TC and subset_master_Stack_Deb_TC.

I imported to Stamps the two files: subset_master_Stack_Deb_Img_Without_TC and subset_master_Stack_Deb_TC. After the Stamps Export procedure I got four directories (DIRS) (geo_data/rtc which I placed into the directory radar_master_data, in case of several Stacks export each Stack and their copy results to the directories directories (DIRS) (geo_data/rtc).

10) To have TS processed export subset_master_Stack_Deb_TC (with latitude and longitude bands) to ENVI or GAMMA format. Save result, for example, to (geo) directory. Rename files with lon and lat to master_data.lon and master_data.lat. These are binary files with latitudes and longitudes for all pixels of the master crop. (One file contains values of lat for all pixels and the other - of lon) All the other files (results of export of the other bands) can be deleted. The files master_data.lon and master_data.lat should be placed into (geo) directory.

You can also add longitude and latitude bands to subset_master_stack_Deb, then do TC and get subset_master_stack_Deb_TC_lon_lat. Export this to ENVI or GAMMA format.

Then like in 10)

There is a bug when exporting to Stamps TC results. You always get wrong value of heading in master_data.rtc.par (it is always equal to 085deg) and thus in STAMPS. The easiest way to overcome this is to change "heading" in (geo)/master_data.rtc.par manually to a correct value.

10) Place the new scripts mt_prep_gamma.bat (changed by Fed.J.) to the (bin) directory of STAMPS and ps_load_rtcdata_gamma.bat (changed by Fed.J.) to the STAMPS matlab directory. [ps_load_rtcdata_gamma.bat](#) (changed by Fed.J.) (5.8 KB)

[mt_prep_gamma_snap](#) (changed by Fed.J.) (6.4 KB)

Rename them into mt_prep_gamma and ps_load_rtcdata_gamma correspondingly.

11) run mt_prep_gamma from the (radar_master_data) directory. mt_prep_gamma radar_master_data/fullpath to the radar_master_data directory 0-4

12) run matlab and launch STAMPS.

Try first step of stamps (1,1) - to be sure that all data are imported properly, then continue. No principal changes in Stamps parameters should be done. Even with default values I managed to get reliable results. Although to improve results adjustment of Stamps parameters is certainly necessary.

Good luck!

Many thanks to the developers and people who shared their experience in adjusting this soft!

How is your work on SARs export? I will be glad if it can help. I am not an expert in writing scripts but I can test.

All the best,
Katherine

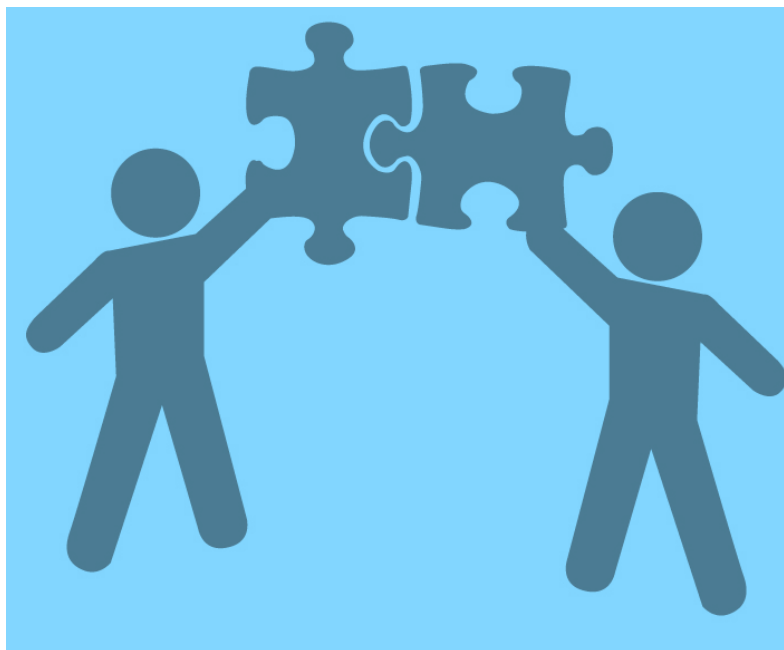
7 Replies

12

Reply

<https://forum.step.esa.int/t/workflow-between-snap-and-stamps/3211/152>



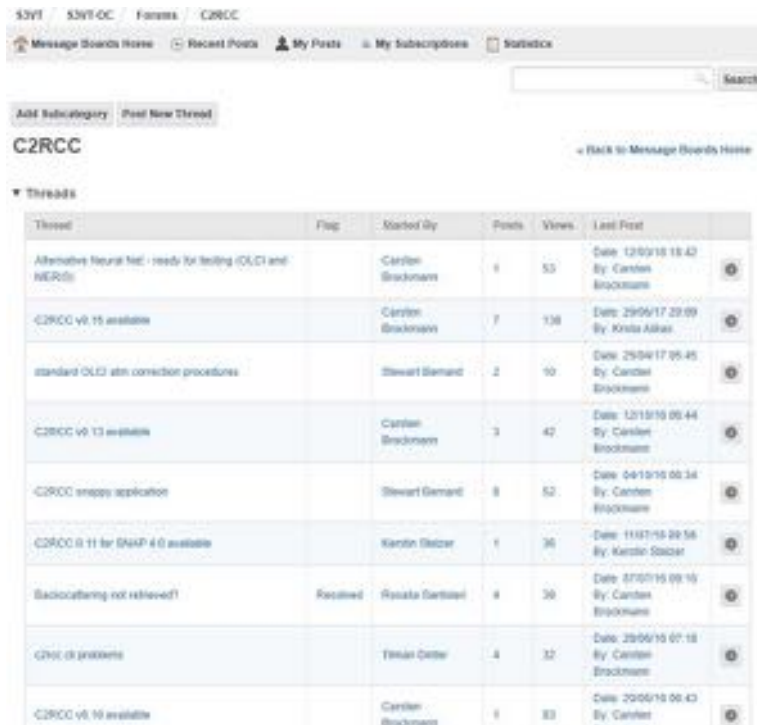


Collaborate

Collaborative work improving water quality parameters in OLCI within S3VT



- S3 ground segment and SNAP C2RCC use same algorithm
- Algorithm did not perform optimal
- Tests can not be performed at ground segment
- C2RCC Plugin was updated and shared via S3VT forum
- Iterative development



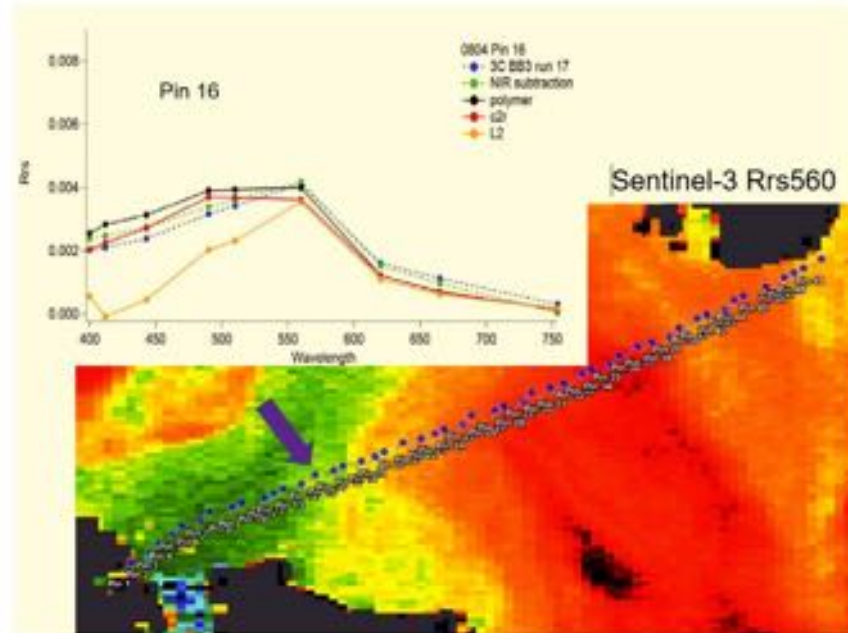
The screenshot shows a forum page for the C2RCC category. It includes a search bar, navigation links, and a table of threads. The table columns are Thread, Flag, Started By, Posts, Views, and Last Post.

Thread	Flag	Started By	Posts	Views	Last Post
Alternative Neural Net - ready for testing (OLCI and MERIS)		Carsten Brackmann	1	53	Date: 12/02/15 18:42 By: Carsten Brackmann
C2RCC v0.15 available		Carsten Brackmann	7	138	Date: 29/06/17 29:09 By: Krista Aikas
standard OLCI atm correction procedures		Stewart Demard	2	90	Date: 29/04/17 05:45 By: Carsten Brackmann
C2RCC v0.13 available		Carsten Brackmann	3	42	Date: 12/10/15 05:44 By: Carsten Brackmann
C2RCC snappy application		Stewart Demard	8	52	Date: 04/10/15 00:34 By: Carsten Brackmann
C2RCC 0.11 for SNAP 4.0 available		Karsten Stoeck	1	36	Date: 11/07/15 20:58 By: Karsten Stoeck
Radiocasterng not relieved!	Resolved	Rosalia Santoni	4	30	Date: 07/07/15 09:10 By: Carsten Brackmann
C2RCC di problems		Timon Oetter	4	32	Date: 29/06/15 07:18 By: Carsten Brackmann
C2RCC v0.10 available		Carsten Brackmann	1	83	Date: 20/05/15 06:43 By: Carsten



Collaborative work improving water quality parameters in OLCI within S3VT

- New alternative neural nets tested
- A lot of data could be processed with SNAP and validated against in-situ data
- Satellite inter-comparisons have been performed
- Discussed results during regular teleconfs and uploaded to the S3VT forum



Maycira Costa / University of Victoria
@S3VT meeting 2018

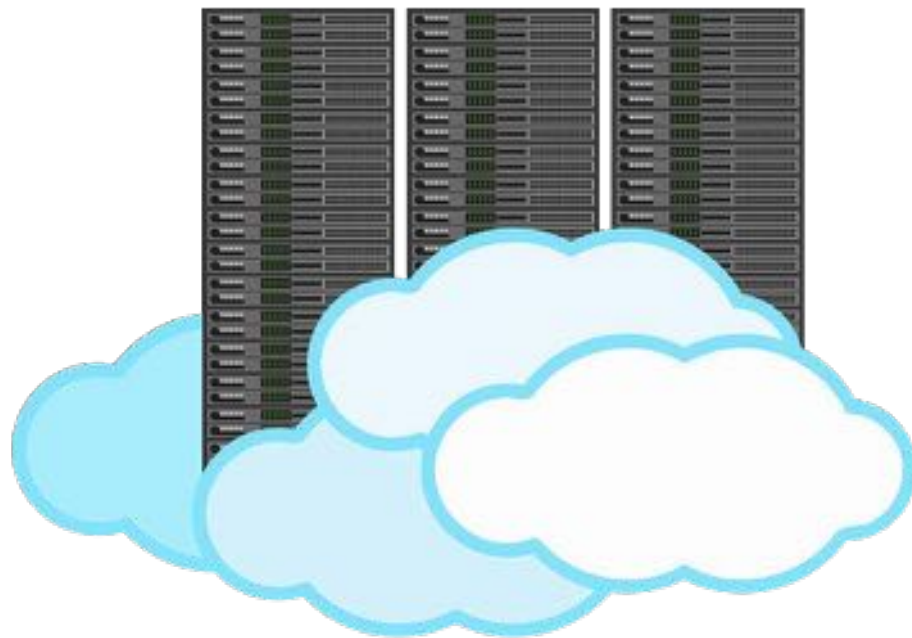
Collaborative work improving water quality parameters in OLCI within S3VT

- SNAP allowed to improve the algorithm in a collaborative manner
- Recently Eumetsat and ESA announced that the new algorithm version will be deployed to the ground segment
- SNAP will be updated for the public too

OLCI L2 Ocean Colour changes in preparation

- **Bright Pixel Correction improvements for Open Water Products**
 - Update in modelling inversion and band uncertainty weighting to reduce BPC failures and product noise
- **Chlorophyll Index switch for oligotrophic waters in Open Water Products** [Hu et al., 2012]
 - Update in chlorophyll algorithm to improve product accuracy in low chlorophyll waters
- **altNN for Complex Water Products**
 - Update in the bio-optical and the total radiative model, product range, and NN training in the bio-optical and the total radiative model, product range, and NN training
- **System Vicarious Calibration gains for Complex Water Products**
 - Development of dedicated SVC gains for the Complex Water NN Products
- **Additional flag 'Cloud Risk' for Complex Water Products**
 - Update to improve diagnosis of cloudy pixels
- **Band Oa10 smile correction, 681.25 nm**
 - Application of smile correction to enable band use in applications

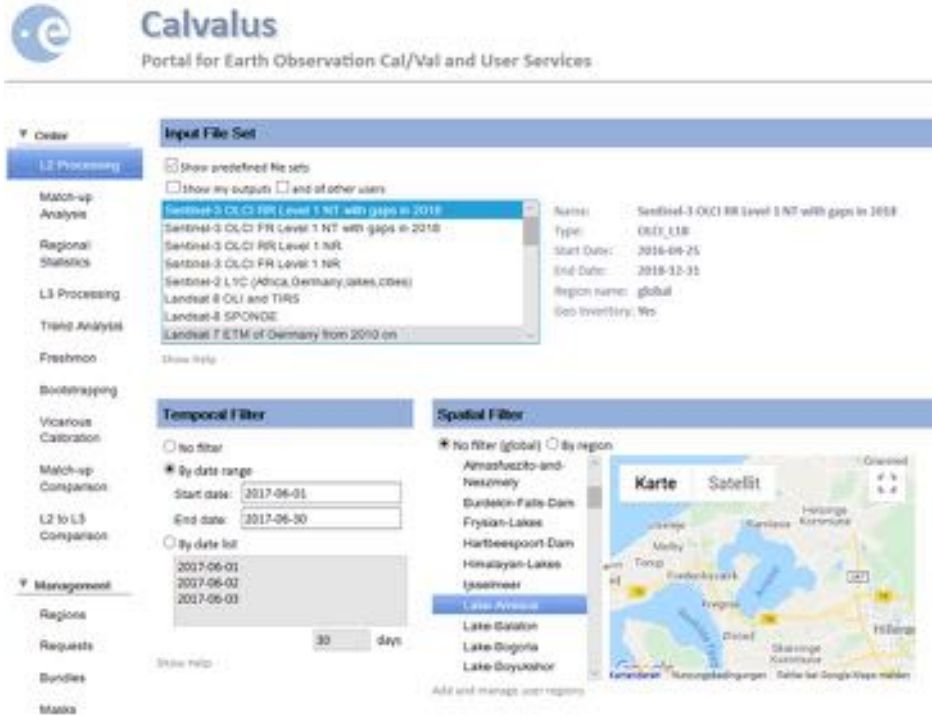




Processing Service

The SNAP Graph Processing Framework (GPF) is mainly driving Calvalus

Cluster has 113 physical nodes
→ 740 simultaneous tasks
2.8 TB RAM,
2.3 PB disk storage



Calvalus
Portal for Earth Observation Cal/Val and User Services

Input File Set

- Show predefined file sets
- Show my outputs and of other users

Name	Type
Sentinel-3 OLCI RR Level 1 NT with gaps in 2018	OCI_L1B
Sentinel-3 OLCI FR Level 1 NT with gaps in 2018	
Sentinel-3 OLCI RR Level 1 NR	
Sentinel-3 OLCI FR Level 1 NR	
Sentinel-2 L1C (Africa, Germany, lakes, coasts)	
LandSat 8 OLI and TIRS	
LandSat 8 SPANDE	
LandSat 7 ETM of Germany from 2010 on	

Temporal Filter

- No filter
- By date range
- Start date: 2017-06-01
- End date: 2017-06-30
- By date list
- 2017-06-01
- 2017-06-02
- 2017-06-03

30 days

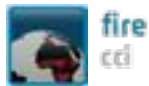
Spatial Filter

- No filter (global)
- By region

- Almashezzko-and-Nesozemy
- Burbin-Fate-Dam
- Frysan-Lakes
- Hartbeespoort-Dam
- Himalayin-Lakes
- Issameer
- Lake-Annecy
- Lake-Garonne
- Lake-Dogoria
- Lake-Doynakhor

Karte Satellit

ESA UNCLASSIFIED - For Official Use



land cover
cci

highroc.eu



WasMon-CT

CalEsa, CalFin, CalEst,
CalLand, CalMar, CalHzg



Outlook

4 Major Topics in the next dev. phase

- Performance
- Time series
- Cloud access
- Development

Kick-Off for new SNAP/S3TBX contract **Tomorrow!**

- Processing Performance with GPF
- Improve Python integration and API
- All operators will be usable in Graph Builder
- ProductGroups (“Virtual stacks”)
- Time series exploration
- Cloud access – data and processing
- Enhanced plugin development and distribution
- Support for data in SIP format (ESA-Collection) e.g. ALOS/PRISM, Landsat8
- Improved support for multi-size data products like Sentinel-2
- Machine Learning Tools

S1TBX

- Sentinel-1 Updates - noise vectors
- S-1 on AWS (now GRD products only)
- Improvement of Stack Generation
- New coherence estimator

S2TBX

- MUSCATE Reader
- Improved S2 resampling
- Fusion Toolbox
- Change Detection toolbox

S3TBX

- OLCI Smile Correction
- OLCI Atmospheric Correction
- Water Quality Operators
- OLCI & SLSTR Synergy L1C Tool

STEP

- Web-Based Plugin Hosting Interface
- Custom SNAP Plugin Dialog
- Tool Usage Statistics per User
- Social Media Tools within SNAP



The SentiNel Application Platform, SNAP, is established as the first-choice tool when new as well as experienced users want to work with ESA's Sentinel, ENVISAT and Earth Explorer data, as well as combining them with other Earth Observation data. SNAP has more than 20 000 user installations and a very active forum with more than 3800 registered users. Today the most common usage of SNAP is via its Desktop application. However, SNAP is more than that, including powerful server side processing, batch-mode, and scripting capabilities, and in combination with the STEP website it offers a suite of collaboration tools enabling knowledge exchange and sharing of results. The support of the validation activities of Sentinel 3 is an excellent example how SNAP validation tools foster improvement of Copernicus products, developed by the community and aiming at ground segment improvement.

Over the next two years the SNAP roadmap foresees further evolution of such community functions. "Sharing of resources" is a paradigm for the development and this addresses not only resources in a technical sense of distributed computing and cloud exploitation, but also in terms of human resources by means to showcase technologies, applications and sharing of ideas. The overarching idea is to bring data applications to life, for the benefit of environment and society.

In this presentation we will demonstrate by start-to-end examples how SNAP can be used today in an optimal way, in a typical distributed network of researchers, to develop their ideas and share data, code and results. We will show how SNAP integrates with the ESA TEP and the Proba-V MEP. Also, the Copernicus DIAS will offer SNAP as a standard tool for the development of front-office services. We will present the roadmap for the next two years, in order to be the starting point for discussion and guidance for refining the foreseen evolution.