



# → 6th ESA ADVANCED TRAINING COURSE ON LAND REMOTE SENSING

## SNAP & Sentinel-2 Practical lesson [D5P1B]

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## Overview

- Description of SeNtinel Application Platform (SNAP)
- Description of Science Toolbox Exploitation Platform (STEP)
- Explore SNAP functionalities to exploit the Sentinel-2 data
- Exercise 1: S2 data subset, reproject and export the result in KMZ
- Exercise 2: mosaic 2 S2 images
- Exercise 3: Collocation between Sentinel-2 and Landsat-8 data
- Do it by your self: mosaic S2 images, reproject and export the result in KMZ

## SNAP

- 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.

Activity funded through SEOM element of ESA's EOEP-4 ([www.seom.esa.int](http://www.seom.esa.int))



## Multi-mission Scientific Toolboxes – Development Consortia





## SNAP Development History

Built on prior toolbox  
development



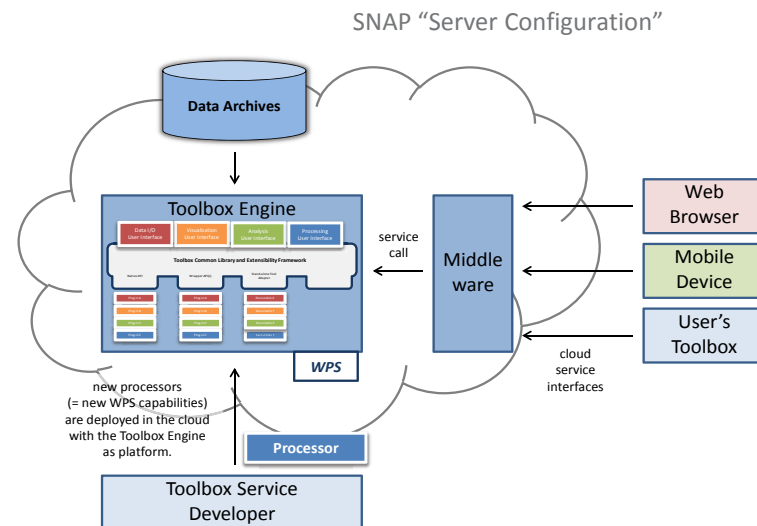
User Developed Plugins





## Benefits of SNAP

- 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







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## Science Toolbox Exploitation Platform



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- Sentinel 1 Toolbox
- Sentinel 2 Toolbox
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## multimission scientific toolboxes

ESA is developing **free open source toolboxes** for the scientific exploitation of **Earth Observation missions** under the Scientific Exploitation of Operational Missions (SEOM) programme element. **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.

The ESA toolboxes support the **scientific exploitation** for the **ERS-ENVISAT** missions, the **Sentinels 1/2/3** missions and a range of **National and Third Party** missions. The three toolboxes are called respectively Sentinel 1, 2 and 3 Toolboxes and share a common architecture called **SNAP**. They contain some functionalities of historical toolboxes such as BEAM, NEST and Orfeo Toolbox that were developed over the last years.



SNAP Features



Documentation



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The following results have been obtained thanks to the Sentinel Toolboxes :



### S1A Country Mosaic of Romania

A dual polarization colour composite of entire Romania using fifteen Sentinel-1A products acquired between October and November 2014.

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## SNAP Download page

### Information on Sentinel Toolboxes' Access to Beta versions for testing development including Frequently Asked Questions (FAQs)

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## Download

Here you can download the latest installers for SNAP and the Sentinel Toolboxes.

Data provision is available to all users via the [Sentinel Data Hub](#).

## Previous Versions

Former releases can be downloaded from the [Previous Versions](#) page. But we highly encourage you to test the beta version for the next release !

## Installers

The next release of **SNAP** is currently in beta stage, with a target date for the final release in mid July. The current version is **2.0 beta 04** (13.07.2015 16:00).

Access to the current installers for the most common platforms (Windows, MacOS, Linux) are provided on-demand to interested beta-testers.

During the installation process you can select to download and install the **Sentinel-1**, **Sentinel-2**, or **Sentinel-3** Toolbox or even all of them.

In return, we ask beta testers to **give feedback** on the software (installation procedure, functionalities, encountered issues, ...) **before the final release in July 2015** on the [Esonline](#).

If you are interested in participating to the beta testing phase of the new release of **SNAP** and the Sentinel Toolboxes, please fill up the contact form below and we will get in touch with you.

Your Name (required):

Your Email (required):

[Send](#)

## Sources

All software is published under the [GPLv3](#) license and its sources are available on [GitHub](#).





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## Science Toolbox Exploitation Platform



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## Technical documentation for both end-users and developers

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### Documentation

#### For end-users

SNAP and Sentinel Toolboxes provide integrated help directly from the software itself.

Also, you will find a number of tutorials available from [here](#).

#### For developers

Developers of SNAP, people interesting in developing new modules or add functionalities to the existing ones should refer to the Wiki for Developer Documentation.

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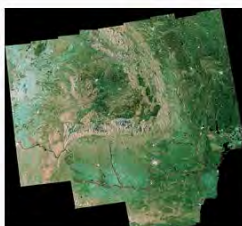


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## Step-by-step tutorials including YouTube videos

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### Sentinel-1 Toolbox Tutorials

[SAR Basics with the Sentinel-1 Toolbox](#)

[Sentinel-1 Stripmap Interferometry](#)

[Sentinel-1 TOPSAR Interferometry](#)

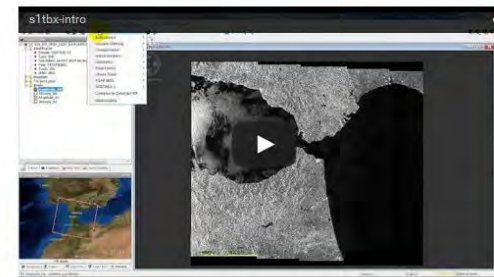
[Radarsat-2 Interferometry](#)

[SAR Polarimetry](#)

[ALOS Orthorectification](#)

### Video Tutorials

### S1TBX Introduction



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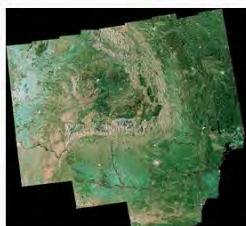


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## Technical forum, gathering user feedback and communicating results

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Category	Latest	Topics
<b>s1tbx</b> The S1 Toolbox category regroup all threads about the Sentinel-1 Toolbox, as SAR readers or processors. <a href="#">Problem Reports</a> <a href="#">Interferometry</a> <a href="#">Polarimetry</a>	<a href="#">Categorizing sentinel-1 SLC data</a> 1h <a href="#">Azimuth Fringes in Cape Verde Tutorial TOPSAR Interferogram</a> 1h <a href="#">Sentinel 1 toolbox memory increase</a> 20h	1 / day 3 / week
<b>s2tbx</b> The S2 Toolbox category regroup all threads about the Sentinel-2 Toolbox as Sentinel-2 product readers and product manipulation, Sentinel-2 processor (as L3A processor for atmospheric correction, L3 processor for temporal synthesis, etc).	<a href="#">Sentinel-2 toolbox and data processing</a> 4h <a href="#">Can't read S2 commissioning sample data</a> 1h <a href="#">Reading S2 L1B in Multisize causes a java.lang.IllegalArgumentException in Linux</a> 1d	2 / week 5 / month
<b>s3tbx</b> The S3 Toolbox category regroup all threads about the Sentinel-3 Toolbox as readers and processors for Sentinel-3 OLCI & SLSTR L1 & L2	<a href="#">OLCI L1 reader artefact</a> 1d <a href="#">Displaying RGB composite for Landsat 5 data</a> 1d	2 / month 2 / year
<b>snaps</b> This category contains all topic about the Sentinel Toolbox Application (SNAP) not related to a specific Sentinel Toolbox	<a href="#">Reader - API</a> 1d <a href="#">SNAP 2.0 beta-04</a> 2h <a href="#">Where is snappy?</a> 2h	2 / week 5 / month

As an open source software, the maintainers of SNAP and the Sentinel Toolboxes welcome code contribution and bug fixes !

The entry point for developers is [here](#).

### Issue tracker

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 !

Issue tracking is provided by Jira and is hosted [here](#).





## EXERCISE 2

### Generation Sentinel-2 Mosaic



## Goals of the Exercises

- Familiarize with ESA Senintinel-2 Toolbox
- Training on the generation of RGB mosaics
- Provide instruction on step-by-step processing of Sentinel-2 data



Contains modified Copernicus Sentinel data [2015]



## Input Dataset

- A set of **Sentinel-2A MSI** images acquired in August 2015

### *S2A\_Verona*

S2A\_OPER\_PRD\_MSIL1C\_PDMC\_20150818T101204\_R022\_V20150813T102406\_20150813T102406.SAFE

### *S2A\_Venice*

S2A\_OPER\_PRD\_MSIL1C\_PDMC\_20150818T101440\_R022\_V20150813T102406\_20150813T102406.SAFE

[downloadable @ <https://scihub.esa.int>]



## EXERCISE

### Generation of S2 Mosaic

#### EXERCISE 1 - PART 1

Step-by-step Processing with  
S2TBX

#### EXERCISE 1 - PART 2

Mosaic Operation



Product spectral subset  
Histogram manipulation  
Mosaic parameters settings





## EXERCISE 3

### EO data Collocation

## Input Dataset

- A set of **Sentinel-2A MSI & Landsat-8** images acquired in August 2015

### *S2A\_Venice*

S2A\_OPER\_PRD\_MSIL1C\_PDMC\_20150818T101440\_R022\_V20150813T102406\_20150813T102406.SAFE

[downloadable @ <https://scihub.esa.int>]

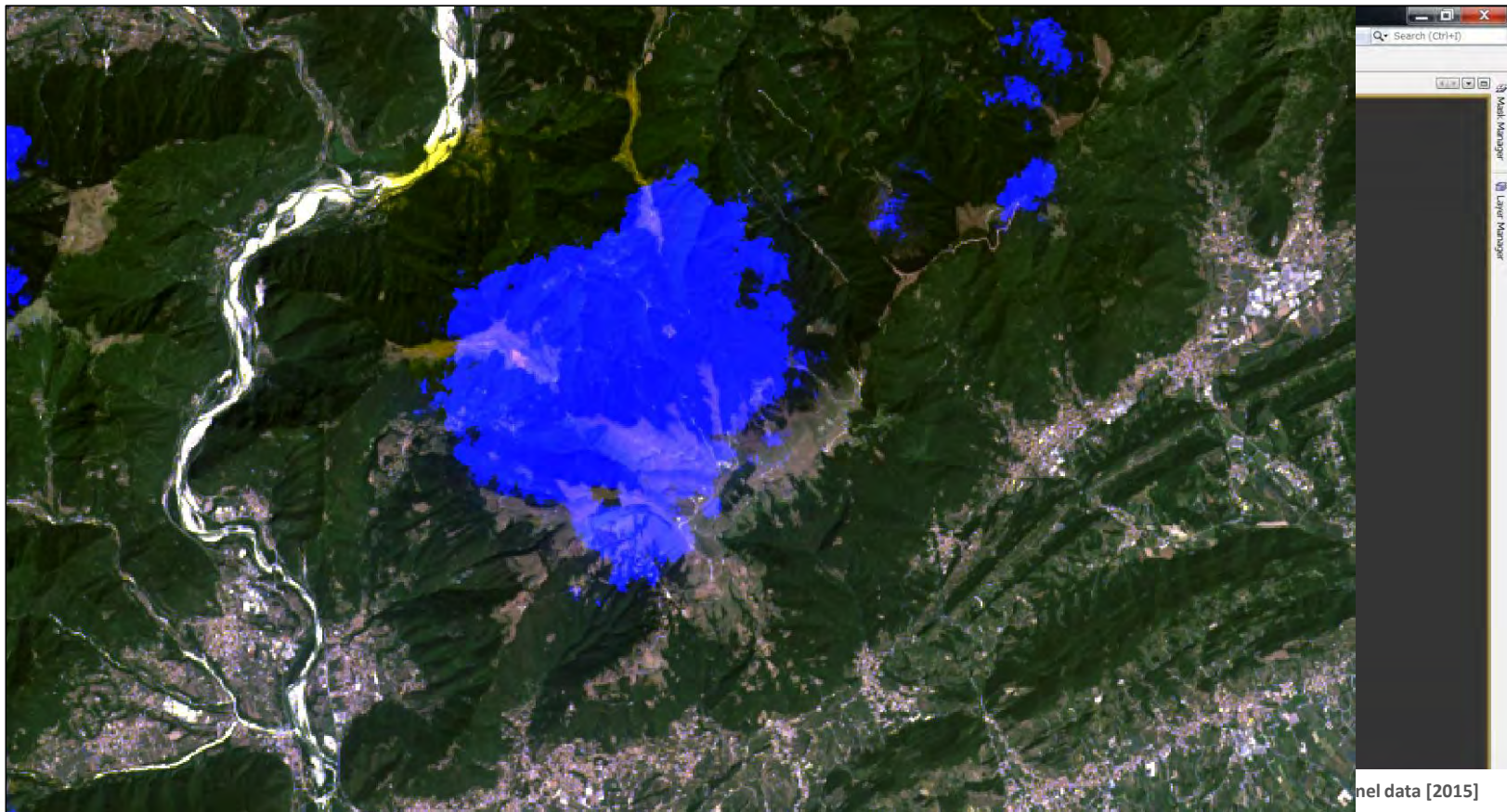
LC81920282015221LGN00

[downloadable @ <https://earthexplorer.usgs.gov>]



## Goals of the Exercise

- Emphasize the multi-mission aspect of SNAP
- Training on the generation of composite in terms of spectral bands coming from different sensors
- Provide instruction on step-by-step processing of Sentinel-2 and ESA TPM data







## EXERCISE

Collocate S2 & L8 images and create a new product

### PART 1

Step-by-step Processing with  
S2TBX

### PART 2

Export in GeoTIFF

### PART 3

S2 & L8 Collocation Operation



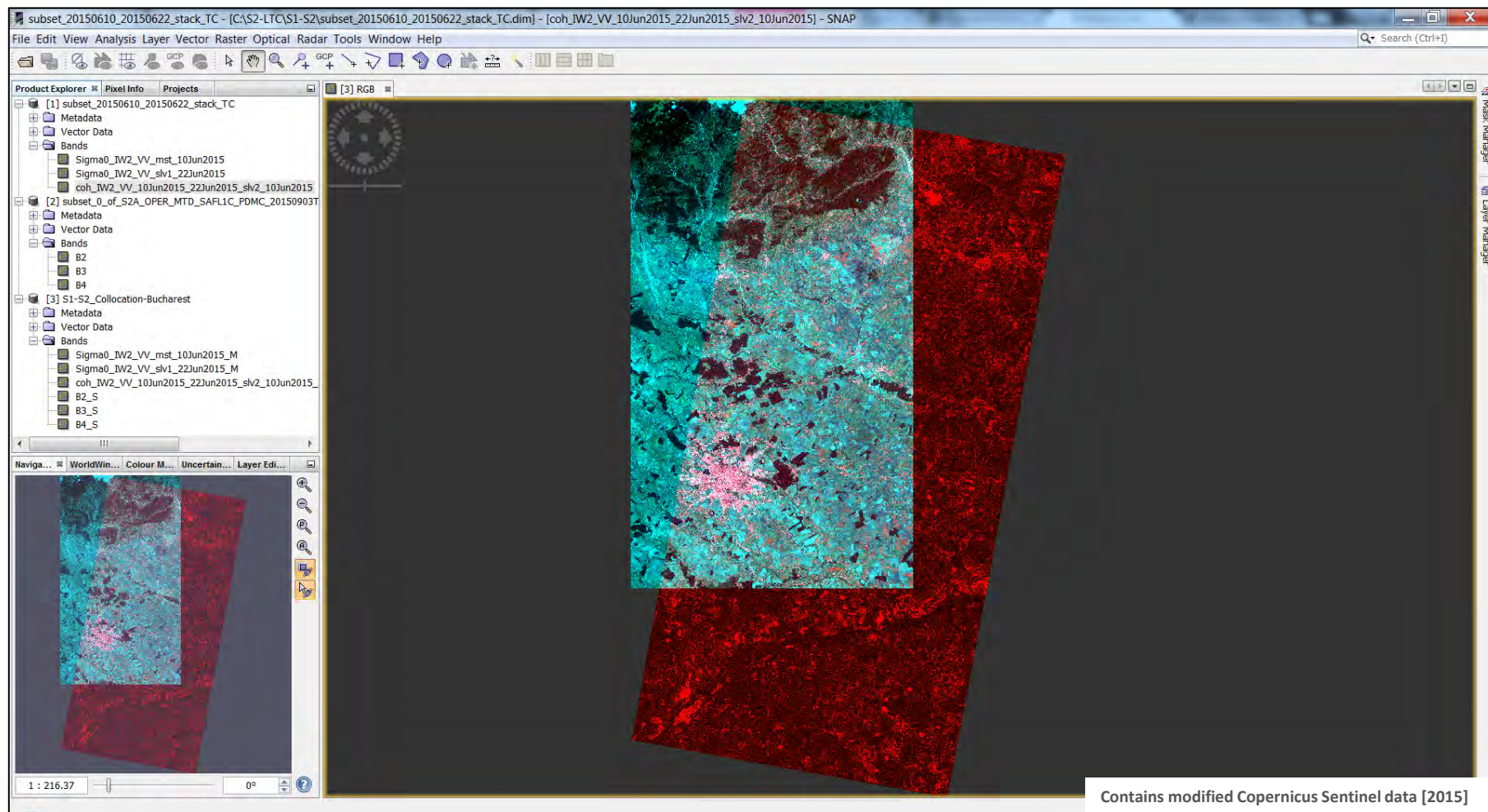
Product spectral subset  
Export data in GeoTIFF



Collocation parameters settings  
Results visualization



# Collocation between S-2 and S-1 data over Bucharest







# EXERCISE

## Do it by your self



## Input Dataset

- A set of **Sentinel-2A MSI** images acquired in August 2015

### *S2A\_Verona*

S2A\_OPER\_PRD\_MSIL1C\_PDMC\_20150818T101204\_R022\_V20150813T102406\_20150813T102406.SAFE

### *S2A\_Venice*

S2A\_OPER\_PRD\_MSIL1C\_PDMC\_20150818T101440\_R022\_V20150813T102406\_20150813T102406.SAFE

### *S2A\_Milan*

S2A\_OPER\_MTD\_SAFL1C\_PDMC\_20150818T101319\_R065\_V20150806T102902\_20150806T102902.SAFE

[downloadable @ <https://scihub.esa.int>]



## EXERCISE

Generation of S2 Mosaic and create a KMZ

### PART 1

Step-by-step Processing with  
S2TBX

### PART 2

Mosaic Operation

### PART 3

Export of Results



Product spectral subset  
Histogram manipulation  
Mosaic parameters settings



Reproject the RGB Mosaic in  
Lat/Lon  
Export in Google Earth formats





## *Land Training Course – User Survey*

<http://step.esa.int/survey/2015-land-training>