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Common borders. Common solutions.

# ESA Sentinel Applications Platform (SNAP) та the Sentinel Toolboxes

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# Вступ

Sentinel-1



Sentinel-2



Sentinel-3



s-1tbx



s-2tbx



s-3tbx



User Developed Plugins

ESA Polarimetric SAR Data Processing and Educational Tool



Michael Foumelis (2017) SENTINEL DATA ACCESS & PROCESSING TOOLS. 7th ESA Advanced Training Course on Land Remote Sensing, Szent István University, Gödöllő, Hungary 4-9 September 2017

# Вступ



# Инструменти

## SNAP SAR Toolbox

### → S1TBX:

- ✓ Support the large archive of data from ESA SAR missions including SENTINEL-1, ERS-1 & 2 and ENVISAT, as well as third party SAR data from ALOS PALSAR, TerraSAR-X, COSMO-SkyMed and RADARSAT-2.

### Evolution of ESA's NEST SAR Toolbox

#### **Maintain and enhance existing functionality from NEST**

- Calibration
- Speckle Filtering
- Terrain Correction
- Ellipsoid Correction
- SAR Simulation
- Mosaicking
- Re-projection
- Co-registration
- Interferometry

#### **Continue to support ESA and TPM**

- SENTINEL-1
- ENVISAT ASAR
- ERS-1 & 2
- RADARSAT-2
- TerraSAR-X/TanDEM-X
- ALOS PALSAR
- COSMO-Skymed

# Инструменти

## → S2TBX:

- ✓ Exploitation of high resolution optical data
- ✓ Sentinel-2, Envisat (MERIS & AATSR), ERS (ATSR), as well as third party data from RapidEye, SPOT, MODIS (Aqua and Terra), Landsat (TM), ALOS (AVNIR & PRISM) and others

## 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

Fabrizio Ramoino (2017) ESA SNAP Sentinel-2 Tools. 7th ESA Advanced Training Course on Land Remote Sensing, Szent István University, Gödöllő, Hungary 4-9 September 2017

# Инструменти

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

## Vegetation indices

- DVI, RVI, PVI
- NDVI, WDV, TNDVI, GNDVI
- SAVI, TSAVI, MSAVI, MSAVI2
- GEMI
- ARVI
- NDI45
- MTCI, MCARI, PSSR $\alpha$
- S2REP, REIP, IRECI

## Soil indices

- BI
- BI2
- RI
- GEMI

## Water indices

- NDWI
- NDWI2
- MNDWI
- NDPI
- NDTI

# Инструменти

## Ocean and Land Colour Instrument: OLCI

Swath	1 440 km
SSI at SSP (km)	300 m
Calibration	MERIS type calibration arrangement with spectral calibration using a doped Erbium diffuser plate, PTFE diffuser plate and dark current plate viewed approximately every 2 weeks at the South Pole ecliptic. Spare diffuser plate viewed periodically for calibration degradation monitoring
Detectors	ENVISAT MERIS heritage back-illuminated CCD55-20 frame-transfer imaging device (780 columns by 576 row array of 22.5 $\mu$ m square active elements).
Optical scanning design	Push-broom sensor. Five cameras recurrent from MERIS dedicated Scrambling Window Assembly (SWA) supporting five Video Acquisition Modules (VAM) for analogue to digital conversion
Spectral resolution	1.25 nm (MERIS heritage), 21 bands.
Radiometric accuracy	< 2% with reference to the sun for the 400-900 nm waveband and < 5% with reference to the sun for wavebands > 900 nm. 0.1% stability for radiometric accuracy over each orbit and 0.5% relative accuracy for the calibration diffuser BRDF.
Radiometric resolution	< 0.03 W m <sup>-2</sup> sr <sup>-1</sup> mm <sup>-1</sup> (MERIS baseline)
Mass	150 kg
Size	1.3 m <sup>3</sup>
Design lifetime	7.5 years

MERIS Bands	$\lambda$ center	Width
<b>Yellow substance/detrital pigments</b>	<b>412.5</b>	<b>10</b>
<b>Chl. Abs. Max</b>	<b>442.5</b>	<b>10</b>
<b>Chl &amp; other pigments</b>	<b>490</b>	<b>10</b>
<b>Susp. Sediments, red tide</b>	<b>510</b>	<b>10</b>
<b>Chl. Abs. Min</b>	<b>560</b>	<b>10</b>
<b>Suspended sediment</b>	<b>620</b>	<b>10</b>
<b>Chl. Abs, Chl. fluorescence</b>	<b>665</b>	<b>10</b>
<b>Chl. fluorescence peak</b>	<b>681.25</b>	<b>7.5</b>
<b>Chl. fluorescence ref., Atm. Corr.</b>	<b>708.75</b>	<b>10</b>
<b>Vegetation, clouds</b>	<b>753.75</b>	<b>7.5</b>
<b>O<sub>2</sub> R-branch abs.</b>	<b>761.25</b>	<b>2.5</b>
<b>O<sub>2</sub> P-branch abs.</b>	<b>778.75</b>	<b>15</b>
<b>Atm corr</b>	<b>865</b>	<b>20</b>
<b>Vegetation, H<sub>2</sub>O vap. Ref.</b>	<b>885</b>	<b>10</b>
<b>H<sub>2</sub>O vap., Land</b>	<b>900</b>	<b>10</b>
New OLCI bands	$\lambda$ center	Width
<b>Aerosol, in-water property</b>	<b>400</b>	<b>15</b>
<b>Fluorescence retrieval</b>	<b>673.75</b>	<b>7.5</b>
<b>Atmospheric parameter</b>	<b>764.375</b>	<b>3.75</b>
<b>Cloud top pressure</b>	<b>767.5</b>	<b>2.5</b>
<b>Atmos./aerosol correction</b>	<b>940</b>	<b>20</b>
<b>Atmos./aerosol correction</b>	<b>1020</b>	<b>40</b>

### → S3TBX:

- Exploitation of medium resolution optical data
- Sentinel-3 (OLCI and SLSTR), Envisat (MERIS & AATSR), ERS (ATSR), SMOS as well as third party data from MODIS (Aqua and Terra), Landsat (TM), ALOS (AVNIR & PRISM) and others.

Ana Rusecas (2017) ESA SNAP Sentinel-3 Tools, OLCI and SLSTR Data 7th ESA Advanced Training Course on Land Remote Sensing, Szent István University, Gödöllő, Hungary 4-9 September 2017

Платформа SNAP

# SNAP 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](#).

## Current Version

The current version is **8.0.0** (19.10.2020 15:00 UTC).

For detailed information about changes made for this release please have a look at the release notes of the different projects: [SNAP](#), [S1TBX](#), [S2TBX](#), [S3TBX](#), [SMOS Box](#), [PROBA-V Toolbox](#)

<https://step.esa.int/main/download/snap-download/>



# Платформа SNAP

File Edit View Analysis Layer Vector Raster Optical Radar Tools Window Help

Search (Ctrl+F)



**Product Explorer**

Product Library

Repository: Scientific Data Hub

Account: gazetov

Mission: Sentinel2

Satellite: Sentinel-2

Satellite Platform:

Start Date: 20-08-2021

End Date: 30-08-2021

Product Type: S2MSI2A

Cloud Cover:

Relative Orbit:

Orbit Direction:

Product Name:

UTM Tile:

Area of Interest:

Navigation Colour Manipulation Uncertainty Visualisation World View

0°

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Area of Interest:

Products: 5 out of 5

Sort By: Product Name Ascending

52A_MSIL2A_20210820T085601_N0301_R007_T35TQM_20210820T102050	URL: https://aphub.copernicus.eu/aphub/odata/v1/Products('52A_MSIL2A_20210820T085601_N0301_R007_T35TQM_20210820T102050') Mission: Sentinel2 Acquisition date: 20-08-2021 11:56:01 Size: 1.02 GB
52A_MSIL2A_20210827T084601_N0301_R107_T35TQM_20210827T102802	URL: https://aphub.copernicus.eu/aphub/odata/v1/Products('52A_MSIL2A_20210827T084601_N0301_R107_T35TQM_20210827T102802') Mission: Sentinel2 Acquisition date: 27-08-2021 11:46:01 Size: 495.9 MB
52A_MSIL2A_20210830T085601_N0301_R007_T35TQM_20210831T164139	URL: https://aphub.copernicus.eu/aphub/odata/v1/Products('52A_MSIL2A_20210830T085601_N0301_R007_T35TQM_20210831T164139') Mission: Sentinel2 Acquisition date: 30-08-2021 11:56:01 Size: 1022.83 MB
52B_MSIL2A_20210822T084559_N0301_R107_T35TQM_20210822T110737	URL: https://aphub.copernicus.eu/aphub/odata/v1/Products('52B_MSIL2A_20210822T084559_N0301_R107_T35TQM_20210822T110737') Mission: Sentinel2 Acquisition date: 22-08-2021 11:45:59 Size: 536.81 MB
52B_MSIL2A_20210825T085559_N0301_R007_T35TQM_20210825T120947	URL: https://aphub.copernicus.eu/aphub/odata/v1/Products('52B_MSIL2A_20210825T085559_N0301_R007_T35TQM_20210825T120947') Mission: Sentinel2 Acquisition date: 25-08-2021 11:55:59 Size: 1016.51 MB

Timeline

Months Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

Product Library Layer Manager Map Manager

# Платформа SNAP

Science Toolbox Exploitation Platform

## Found 70 tutorials

SNAP (GENERAL TOOLBOX USAGE)

SENTINEL-1 TOOLBOX (SAR APPLICATIONS)

SENTINEL-2 TOOLBOX (HIGH RESOLUTION OPTICAL APPLICATIONS)

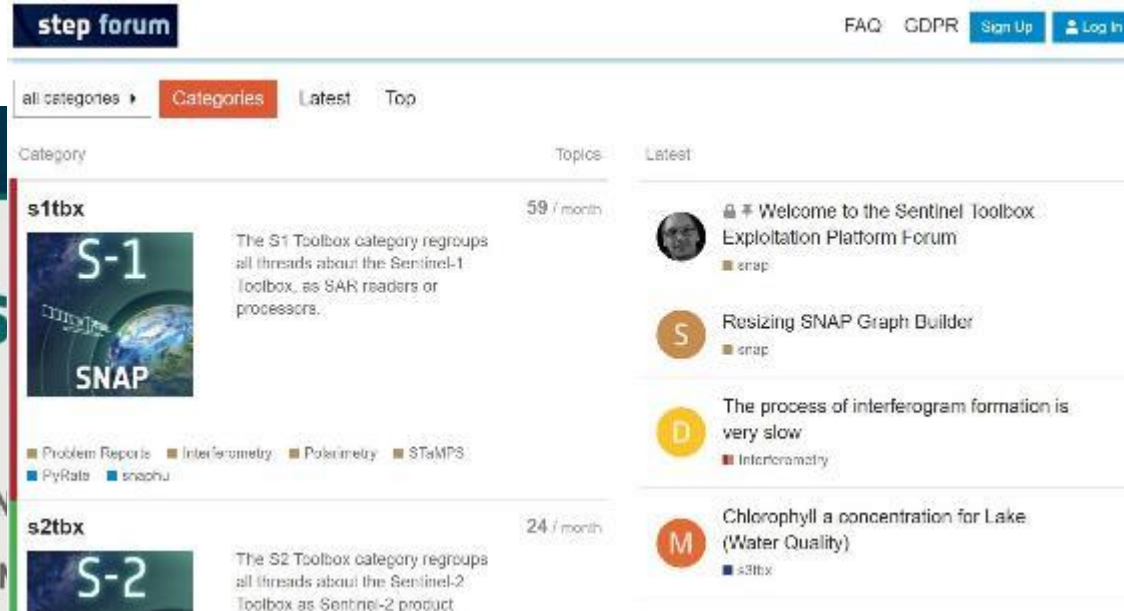
SENTINEL-3 TOOLBOX (MEDIUM RESOLUTION OPTICAL APPLICATIONS)

ESA TRAINING COURSES (ESA TRAINING COURSES)

EXTERNAL RESOURCES (EXTERNAL RESOURCES)

OTHER (OTHER TUTORIALS)

ALL (ALL TUTORIALS)



The screenshot shows the 'step forum' website. At the top, there are navigation links for 'FAQ', 'GDPR', 'Sign Up', and 'Log In'. Below the navigation, there are tabs for 'all categories', 'Categories', 'Latest', and 'Top'. The main content area is divided into two columns: 'Category' and 'Latest'. The 'Category' column lists 's1tbx' and 's2tbx' with their respective descriptions and a list of sub-categories. The 'Latest' column shows a list of forum posts with their titles, authors, and dates.

**step forum**

all categories Categories Latest Top

Category Topics Latest

**s1tbx** 59 / month

The S1 Toolbox category regroups all threads about the Sentinel-1 Toolbox, as SAR readers or processors.

- Problem Reports
- Interferometry
- Polarimetry
- STaMPS
- PyRate
- snachu

**s2tbx** 24 / month

The S2 Toolbox category regroups all threads about the Sentinel-2 Toolbox as Sentinel-2 product.

**Welcome to the Sentinel Toolbox Exploitation Platform Forum**  
snap

**Resizing SNAP Graph Builder**  
snap

**The process of interferogram formation is very slow**  
Interferometry

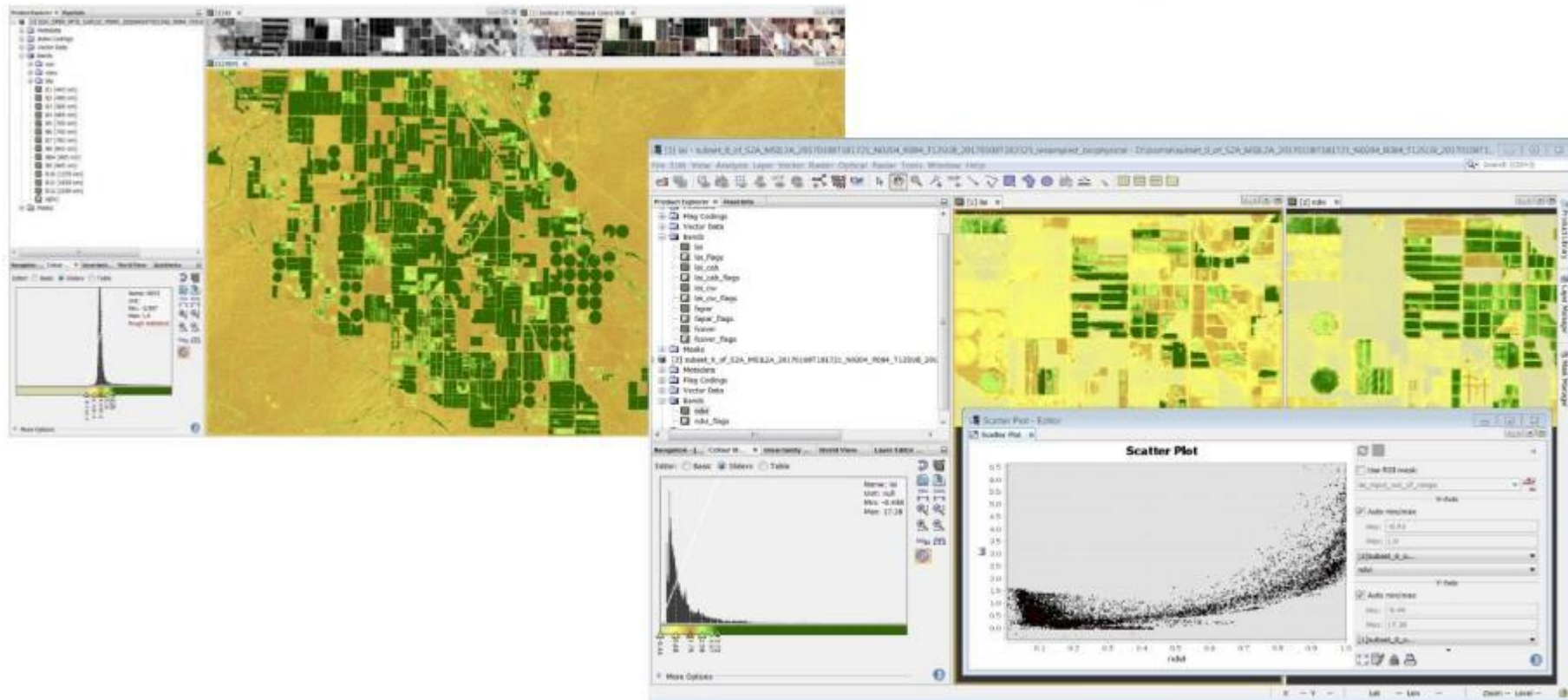
**Chlorophyll a concentration for Lake (Water Quality)**  
s3tbx

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

<https://step.esa.int/main/doc/tutorials/>

# Приклади продуктів SNAP

S2TBX – Product examples: vegetation monitoring



Brice Mora (2019) Sentinel Application Platform (SNAP). MedRIN meeting, Paphos, Cyprus, 20 March, 2019

# Приклади продуктів SNAP

## Sentinel-2 Toolbox

*LAI – Amazon Forest*



# Підготовка до практичного заняття в SNAP

1) Скачати інсталяцію платформи SNAP із Sentinel Toolboxes з сайту (900 MB): <https://step.esa.int/main/download/snap-download/>

Вимоги до комп'ютера: 4GB пам'яті, 3D graphics card, 32 або 64-бітна Windows, Mac OS X або Linux.

2) Встановити 8-у версію SNAP і три Toolboxes та GoogleEarth

3) Скачати косм. знімок Sentinel-2 району Дністровського лиману (732 MB): [https://drive.google.com/file/d/172IH3iQDNvTbXTS1YmeJEW\\_f285HVUI/view?usp=sharing](https://drive.google.com/file/d/172IH3iQDNvTbXTS1YmeJEW_f285HVUI/view?usp=sharing)

4) Розархівувати космічний знімок (767 MB).

5) Скачати та підготуватись до практикуму за програмою:

<https://docs.google.com/document/d/1pGyELiCNy9u-sgORZ53eS6HZ2nYqZ8lC/edit?usp=sharing&ouid=113513181147961947467&rtpof=true&sd=true>

# Дякую за увагу!

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