

# Unit 1 - Ocean Colour Data Handling with SNAP

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Phytoplankton from space: intro to ocean color – 29 & 30 June 2019 Ocean Optics & Ocean Color Remote Sensing

This project received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement nº 810139.



#### Contents



- Practical (short) course on ocean colour (OC) remote sensing using Sentinel Application Platform (SNAP).
- Lectures:
  - Unit 1 :
    - Ocean colour data (sensors and data archives)
    - Exploring OC data using SNAP
  - Unit 2:
    - Validation Tools
  - Unit 3:
    - Batch Processing



## **Ocean Colour Sensors**



• There are more sensors, check: http://ioccg.org/resources/missions-instruments/

Sensor / Satellite	Agency	Spatial resolution (m)	Bands	Spectral Coverage (nm)	Operating Dates
OLCI/Sentinel 3A and 3B	ESA	300/1200	21	400 - 1020	Feb. 2016
MODIS/Aqua	NASA	250/500/1000	36	405-14,385	May 2002
VIIRS/Suomi NPP, NOAA-20	NOAA/NASA	375 / 750	22	402 - 11,800	Oct. 2011
GOCI/COMS	KARI/KIOST	500	8	400 - 865	June 2010
MERIS/ ENVISAT	ESA	300/1200	15	412-1050	Mar. 2002 – Sep. 2012
SeaWiFS/ OrbView-2	NASA	1100	8	402-885	Aug. 1997 – Feb. 2011



#### Where to access data



- NASA's Ocean Color Web (https://oceancolor.gsfc.nasa.gov/): level 1 to level 3 data, several sensors: CZCS, MODIS-Aqua, MODIS-Terra, GOCI, HICO, MERIS, OCTS, S3OLCI, SeaWiFS, VIIRS.
- Copernicus data Portal (https://scihub.copernicus.eu/dhus/#/home + video on how to access Copernicus ocean colour data - https://www.youtube.com/watch? v=V3NAuafvIFM): all Sentinel data, level 1 and 2.
- Merged products:
  - GlobColour Project: http://www.globcolour.info/
  - ESA Ocean Colour CCI (OC-CCI) project: http://www.esa-oceancolour-cci.org/



#### NASA's OceanColor Web



http://oceancolor.gsfc.nasa.gov/

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NASA's OceanColor Web is supported by the Ocean Biology Processing Group (OBPG) at NASA's Goddard Space Flight Center. Our responsibilities include the collection, processing, calibration, validation, archive and distribution of ocean-related products from a large number of operational, satellite-based remote-sensing missions providing ocean color, sea surface temperature and sea surface salinity data to the international research community since 1996.

#### **Ocean Color Feature**

Crozet Islands





## NASA's OceanColor Web



- Ocean Colour (and SST) products : OLCI, MERIS, CZCS, SeaWiFS, MODIS Terra/Aqua, VIIRS, OCTS, HICO, GOCI
- https://oceancolor.gsfc.nasa.gov/

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• <u>https://oceancolor.gsfc.nasa.gov/cgi/browse.pl?sen=am</u> → need to register!





#### GlobColour dataset



- <u>http://hermes.acri.fr/index.php</u>
- Long time series of ocean colour data: single-sensor and merged products



#### ESA OC-CCI dataset



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- <u>http://www.esa-oceancolour-cci.org/</u>
- Long time series of ocean colour data
- Version 4 of the ESA OC-CCI dataset comprises of globally merged MERIS, Aqua-MODIS, SeaWiFS and VIIRS data with associated per-pixel uncertainty information

Ces	a climate change initiative	European Space Agency
	ESA   CCI   aerosol   cloud   cmug   fire   ghg   glaciers   ice sheets   land cover   ocean colour   ozone   sea ice   sea level   soil moisture	sst
Ocean Colour	Ocean Colour CCI	User login
	The Ocean Colour CCI (OC_CCI) project focuses on the Ocean Colour ECV encompassing water-leaving radiance in the visible domain, derived chlorophyll and inherent optical properties and will utilise data archives of from ESA's MERIS and NASA's SeaWiFS, MODIS and possibly CZCS (after careful evaluation) sensors archives. It is also looking at the feasibility of using OCM-2	Username: *
	and VIIRS data as a "gap filler" before the launch of Sentinel-3.	Password: *
	Version 4 Dataset Release	Log in
	The latest version of the OC-CCI dataset is 4.0 that comprises of globally merged MERIS, Aqua-MODIS, SeaWiFS and VIIRS data with associated per-pixel uncertainty information. This is an update of the version 3.1 product that	Search
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## OLCI – Sentinel Data Hub



- <u>https://scihub.copernicus.eu/dhus/#/home</u> → need to register!
- OLCI L1/L2 data
- OLCI L1 also available at NASA's Oceancolor website

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## SNAP: ESA SeNtinel Application Platform

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



We offer three different installers for your convenience. Choose the one from the following table which suits your needs. During the installation process, each toolbox can be excluded from the installation. Toolboxes which are not initially installed via the installer can be later downloaded and installed using the plugin manager. Please note that SNAP and the individual Sentinel Toolboxes also support numerous sensors other than Sentinel.

#### **SNAP: Desktop Basic Functions**



- Open products and display bands
  - Open OLCI Level 2 data (\*.xml file)

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- 1) Create RGB
- 2) Panning and zooming
- 3) Display CHL product
- 4) Synchronize views
- 5) Colour Manipulation
- 6) Subset



#### **SNAP: Desktop Basic Functions**



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#### **SNAP: Desktop Basic Functions**



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#### **SNAP: RGB**

- Combination of three bands
- Right mouse click on product name  $\rightarrow$  open RGB Image View
- Choose band combination (several pre-defined combinations are available, e.g. OLCI L2W - 17,6,3)



	Select RGR-Image Channels	
Profile		
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Green:	OaO6_reflectance 🗘	
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#### **SNAP:** Navigation

• Zoom in, zoom out...







#### SNAP: Display CHL product





#### SNAP: Syncronize image views



- Link the display windows and navigate in the different windows.
- View  $\rightarrow$  syncronize image views.



## **SNAP:** Colour Manipulation

#### **Colour Manipulation**

- Open colour manipulation window 👤
- Contrast stretch:
  - 1<sup>st</sup> option: change position of slider
  - 2<sup>nd</sup> option: click on number and type directly your pixel value for the respective colour

#### Assign colours

- via basic: pre-defined colour schemes
- via sliders: click on the triangles, select your colour, add colour slider with right mouse click (in between min/ max)
- via table: edit colour and value by typing
- Best choice: import pre-defined colour scheme
- reset to defaults values  $\Im$







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## **SNAP: Colour Manipulation**



- What to do:
  - Adjust colours in greyscale images to enhance features







#### **SNAP: Colour Manipulation**



- What to do:
  - Apply pre-defined colour schemes



#### **SNAP:** Subset



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- Zoom in your region  $\rightarrow$  Raster  $\rightarrow$  Subset  $\rightarrow$  save it!
- Select your subset region, enter either Pixel coordinates or Lat/Lon values
- Select bands/tie-points to be copied to subset



#### **SNAP:** Subset Au Σ φ,λ 1 and a second × × 6 Q~ Search (\#+I) Product Explorer 💿 🛛 Pixel Info 📕 [2] CHL\_NN 🛽 [2] S3A OL 2 WRR 20190622T095648 20190622T104112 20190622T124 Metadata ► Flag Codings ► Vector Data ► Tie-Point Grids 🔻 🔄 Bands Specify Product Subset ▶ 🗋 Oa\*\_reflectance ▶ 違 Oa\*\_reflectance\_err Spatial Subset Band Subset Tie-Point Grid Subset Metadata Subset ▶ 🗋 A865 ▶ 🗋 ADG 🔻 🗟 CHL Pixel Coordinates Geo Coordinates CHL\_NN CHL\_NN\_err Scene start X: 483 🗘 CHL\_OC4ME CHL\_OC4ME\_err Scene start Y: 4,946 🗘 Ð ▶ 🚞 IWV Mask Manage Scene end X: 956 🗘 ▶ 🗋 KD490 🕨 🚞 PAR Scene end Y: 5,420 0 Navigation - [2] ... 🙁 Colour Manipulatio... Uncertainty Visuali... Scene step X: 1 🗘 1 0 Scene step Y: 474.0 Subset scene width: Subset scene height: 475.0 Source scene width: 1217 Source scene height: 15139 Fix full width Use Preview Fix full height Estimated, raw storage size: 183.6M Cancel OK Help 1.5:1 0° X -- Y --Zoom -- Level ---- Lon Lat --





# End of Unit 1

Thanks to Ana Ruescas (Brockmann Consult) for originally developing material for the SNAP course. Some of her slides and ideas we could use here too.

