Near Real Time (NRT) data from ESA Sentinel Satellites

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1.1 Sentinel-3 OLCI NRT data

The Sentinel -3 satellite carries a push-broom imaging spectrometer instrument called the Ocean and Land Colour Instrument (OLCI). The OLCI instrument allows global coverage to be provided in 2-3 days. Sentinel-3 OLCI Near Real Time (< 3 hours latency) Level 1 and Level 2 data are available in Copernicus Open Access Hub (https://scihub.copernicus.eu/dhus/#/home) and Copernicus online data access (https://eoportal.eumetsat.int/).

The OLCI instrument measures reflected solar radiation from the Earth's surface and clouds simultaneously in 21 spectral bands (400–1020 nm) with a swath width of 1270 km and a spatial resolution of 300 m (*Table 1*). OLCI products are available at two spatial resolutions: 1) Full Resolution (FR) at approximately 300 m; 2) Reduced Resolution (RR) at approximately 1.2 km. To simplify OLCI operations, maximize instrument autonomy and offer maximum flexibility for data processing and re-analysis, OLCI always operates (both land and ocean) in FR mode. For the nominal orbit, at sub-satellite point, OLCI Full Resolution is approximately 300 m on ground. From Level-1B, OLCI products are provided in a sub-sampled version, referred to as RR. RR is obtained by averaging the signal of a grid of 16 FR pixels (4 Along Track x 4 Across Track). For the nominal orbit, at sub-satellite point, OLCI Reduced Resolution is approximately 1.2 km on ground. Note that all pixels flagged as cloudy are discarded from OLCI Level-2 processing.

Within the OLCI Level-2 Land Reduced (OL_2_LRR) or Full (OL_2_LFR) Resolution products, there is a rectified reflectances product in red band (Oa10 at the central wavelength with 681.25 nm) and NIR band (Oa17 at the central wavelength with 865 nm) (*Table 2*). By-products of the OGVI, the so-called red and NIR rectified reflectances are virtual reflectance largely decontaminated from atmospheric and angular effects, and good proxy to Top of Canopy reflectances.

1.2 Sentinel-3 SYNERGY Non Time Critical (NTC) Surface Directional Reflectance (SDR) products

The OLCI Level-2 S3A/B_OL_2_LFR product does not provide surface reflectances, while the Sentinel-3 Synergy Level-2 S3A_SY_2_SYN product contains surface reflectances over land surfaces. However, the Synergy Level-2 products are generated and distributed only in Non Time Critical (NTC) with a spatial resolution of 300m, where NTC means products are available in less than 1 month from sensing. Typically, the product should be available within 24 or 48 hours (but this is not guaranteed). The Synergy SYN product relies on the combination of the products of OLCI and SLSTR instruments. The SYNERGY Level-2 SYN product (SY_2_SYN) provides the Surface Directional Reflectance (SDR) with their associated error estimates for all OLCI channels, except for the oxygen absorption bands Oa13, Oa14, Oa15, and the water vapour bands Oa19 and Oa20, where SDR refers to the Atmospherically corrected Surface Directional Reflectance (also called Lambert Equivalent Reflectance (LER) or Bidirectional Reflectance Factor (BRF)).

1.3 Sentinel-3 SLSTR NRT data

The Sentinel-3 satellite carries a dual view (near-nadir and backward views) conical imaging radiometer called the Sea and Land Surface Temperature Radiometer (SLSTR) instrument. The mean global coverage revisit time for dual view SLSTR observations is 1.9 days at the equator (one operational spacecraft) or 0.9 days (in constellation with a 180° in-plane separation between the two spacecraft) with these values increasing at higher latitudes due to orbital convergence. The spatial resolution for SLSTR products is 500 m for solar reflectance bands (S1-S6), and 1 km for thermal infrared bands (S7-S9 and F1-F2). SLSTR has 11 spectral bands with wavelengths in VNIR/SWIR/TIR from 0.55 to 12 µm (Table 3).

Table 1. Sentinel-3 OLCI NRT (< 3 hours latency) data

Data product description	Data product name	Spatial Resolution	Example filename
Sentinel-3 OLCI Level-1 Reduced Resolution Top of Atmosphere Reflectance	OL_1_ERR	1.2 km	S3B_OL_1_ERR____20210715T151324_20210715T155744_20210715T175920_2660_054_339_____MAR_O_NR_002.SEN3 (Oa01_radiance.nc,...,Oa21_radiance.nc,geo_coordinates.nc,instrument_data.nc,qualityFlags.nc,tie_geo_coordinates.nc,tie_geometries.nc,tie_meteo.nc,time_coordinates.nc,xfdumanifest.xml)
Sentinel-3 OLCI Level-1 Full Resolution Top of Atmosphere Reflectance	OL_1_EFR	300 m	S3B_OL_1_EFR____20210715T153211_20210715T153511_20210715T175020_0180_054_339_2340_MAR_O_NR_002.SEN3 (Oa01_radiance.nc,...,Oa21_radiance.nc,geo_coordinates.nc,instrument_data.nc,qualityFlags.nc,removed_pixels.nc,tie_geo_coordinates.nc,tie_geometries.nc,tie_meteo.nc,time_coordinates.nc,xfdumanifest.xml)
Sentinel-3 OLCI Level-2 Water Reduced Resolution products	OL_2_WRR	1.2 km	S3A_OL_2_WRR____20210714T143756_20210714T152216_20210714T172319_2660_074_082_____MAR_O_NR_003.SEN3 (Oa01_reflectance.nc,..,Oa12_reflectance.nc,Oa16_reflectance.nc,Oa17_reflectance.nc,Oa18_reflectance.nc,Oa21_reflectance.nc,chl_nn.nc,chl_oc4me.nc,geo_coordinates.nc,instrument_data.nc,iop_nn.nc,iwv.nc,par.nc,tie_geo_coordinates.nc,tie_geometries.n

			c,tie_meteo.nc,time_coordinates.nc,trsp.nc,tsm_nn.nc,w_aer.nc, wqsf.nc,xfdumanifest.xml)
Sentinel-3 OLCI Level-2 Water Full Resolution products	OL_2_WFR	300 m	S3A_OL_2_WFR____20210714T145646_20210714T145946_2021 0714T171416_0179_074_082_2340_MAR_O_NR_003.SEN3 (Oa01_reflectance.nc,..,Oa12_reflectance.nc,Oa16_reflectance.nc ,Oa17_reflectance.nc,Oa18_reflectance.nc,Oa21_reflectance.nc,c hl_nn.nc,chl_oc4me.nc,geo_coordinates.nc,instrument_data.nc,i op_nn.nc,iwv.nc,par.nc,tie_geo_coordinates.nc,tie_geometries.n c,tie_meteo.nc,time_coordinates.nc,trsp.nc,tsm_nn.nc,w_aer.nc, wqsf.nc,xfdumanifest.xml)
Sentinel-3 OLCI Level-2 land and atmospheric geophysical products at Reduced Resolution	OL_2_LRR	1.2 km	S3B_OL_2_LRR____20210719T165051_20210719T173510_20210 719T191939_2659_055_012_____LN1_O_NR_002.SEN3 (geo_coordinates.nc,instrument_data.nc,iwv.nc,lqsf.nc,ogvi.nc,ot ci.nc,rc_ogvi.nc,tie_geo_coordinates.nc,tie_geometries.nc,tie_me teo.nc,time_coordinates.nc,xfdumanifest.xml)
Sentinel-3 OLCI Level-2 land and atmospheric geophysical products at Full Resolution	OL_2_LFR	300m	S3A_OL_2_LFR____20210718T145301_20210718T145601_20210 718T164402_0179_074_139_2340_LN1_O_NR_002.SEN3 (geo_coordinates.nc,instrument_data.nc,iwv.nc,lqsf.nc,ogvi.nc,ot ci.nc,rc_ogvi.nc,tie_geo_coordinates.nc,tie_geometries.nc,tie_me teo.nc,time_coordinates.nc,xfdumanifest.xml)

Table 2. Description of OLCI Level-2 Land Reduced (S3A/B_OL_2_LRR) or

Full (S3A/B_OL_2_LFR) Resolution NRT (< 3 hours latency) products

Variables	Description	Units	Input Bands	File names
OLCI Global Vegetation Index (OGVI)	Fraction of Absorbed Photosynthetically Active Radiation (FAPAR) in the plant canopy	dimensionless	Oa03, Oa10, Oa17	ogvi.nc
OLCI Terrestrial Chlorophyll Index (OTCI)	Estimates of the Chlorophyll content in terrestrial vegetation, aims at monitoring vegetation condition and health	dimensionless	Oa10, Oa11, Oa12	otci.nc
Integrated Water Vapour (IWV)	Total amount of water vapour integrated over an atmosphere column	kg.m-2	Oa18, Oa19	iwv.nc
Rectified Reflectance RC681 and RC865	By-products of the OGVI, the so-called red and NIR rectified reflectances are virtual reflectance largely decontaminated from atmospheric and angular effects, and good proxy to Top of Canopy reflectances.	dimensionless	Oa10, Oa17	rc_ogvi.nc

Table 3 Sentinel-3 SLSTR NRT (< 3 hours latency) data

Data product description	Data product name	Spatial Resolution
Level-1B TOA radiances (0.5 km resolution) and brightness temperatures (1 km resolution).	SL_1_RBT	0.5 km/ 1 km
Level-2 Fire Radiative Power (FRP)	SL_2_FRP	1 km
Level-2 Aerosol Optical Depth	SL_2_AOD	4.5 km
Level-2 Land Surface Temperature (LST) and associated parameters.	SL_2_LST	1 km
Level-2P brightness temperatures, SSTs, sea ice fraction, and wind speed. SSTs are based on the Group for High Resolution Sea Surface Temperature (GHRSST) Level-2P specification.	SL_2_WST	1 km

2. Sentinel-5P TROPOMI Near Real Time (NRT) data

The TROPOMI/Sentinel-5P instrument provides a full daily surface coverage of radiance and reflectance measurements for latitudes > 7° and < -7°, and better than 95 % coverage for latitudes in the interval [-7°, 7°]. Sentinel-5P TROPOMI data are in Sentinel-5P Pre-Operations Hub (https://s5phub.copernicus.eu/dhus/#/home) with s5pguest/s5pguest as the username/password. In the data portal, Near Real Time (NRT) data are available for a few L2 products. The L1b radiance and irradiance products are available to users in off-line (OFFL) timeliness.

Copernicus EO Support said for NRT processing the availability of products must be within 3 hours after sensing. Total columns of ozone, sulfur dioxide, nitrogen dioxide, carbon monoxide, formaldehyde, vertical profiles of ozone, cloud & aerosol information are provided in NRT. These products have a Rolling Policy of 30 days.

The spatial resolution of Sentinel-5P TROPOMI data is up to 5.5 km x 3.5 km, which means a spatial resolution of 5.5 km in the satellite flight direction and 3.5 km in the perpendicular direction at nadir. Data released before 6 August 2019 had a resolution in the flight direction up to 7 km.

Table 3. List of Sentinel-5P TROPOMI NRT (< 3 hours latency) data

Data product description	Data product name	Example filename
Sentinel-5P TROPOMI UV Aerosol Index	S5P_L2_AER_AI	S5P_NRTI_L2__AER_AI_20180708T234321_20180708T234821_03812_01_010002_20180709T012327.nc
Sentinel-5P TROPOMI Aerosol Layer Height (mid-level pressure)	S5P_L2_AER_LH	S5P_NRTI_L2__AER_LH_20190703T122410_20190703T122910_08911_01_010302_20190703T130917.nc
Sentinel-5P TROPOMI Cloud fraction, albedo, top pressure	S5P_L2_CLOUD_	S5P_NRTI_L2__CLOUD__20180704T085914_20180704T090414_03746_01_020103_20180704T094813.nc
Sentinel-5P TROPOMI Carbon Monoxide (CO) total column	S5P_L2__CO____	S5P_NRTI_L2__CO_____20180601T130316_20180601T130816_03280_01_010001_20180601T133329.nc

Sentinel-5P TROPOMI Formaldehyde (HCHO) total column	S5P_L2_HCHO_	S5P_NRTI_L2__HCHO___20190729T000912_20190729T001412_09273_01_020103_20200608T142937.nc
Sentinel-5P TROPOMI Nitrogen Dioxide (NO2), total and tropospheric columns	S5P_L2__NO2___	S5P_NRTI_L2__NO2____20201007T202447_20201007T220617_15471_01_020200_20210515T213556.nc
Sentinel-5P TROPOMI Ozone (O_3) total column	S5P_L2_O3_	S5P_NRTI_L2__O3_____20190405T030130_20190405T030630_07643_02_020103_20190405T034612.nc
Sentinel-5P TROPOMI Sulfur Dioxide (SO2) total column	S5P_L2_SO2	S5P_NRTI_L2__SO2____20190811T234126_20190811T234626_09471_01_020103_20200705T032441.nc

3. Sentinel-1 data

The Sentinel-1 mission is designed as a two-satellite constellation. Each satellite carries a single C-band synthetic-aperture radar (C-SAR) with its electronics. From the user guide, it said Sentinel-1 data will be delivered within an hour of reception for Near Real-Time (NRT) emergency response and within three hours for NRT priority areas. Except in emergency situations, there is no NRT data from Sentinel-1 with the latency less than 3 hours. The latency is about 5-6 hours if getting Sentinel-1 dataset from ESA Copernicus Open Access Hub (https://scihub.copernicus.eu). ASF DAAC (https://asf.alaska.edu/data-sets/sar-data-sets/sentinel-1/) now have Sentinel-1 data available between 7 and 20 hours after acquisition.

4. Sentinel-2 data

The Sentinel-2 satellites each carry a single multi-spectral instrument (MSI) with 13 spectral channels in the visible/near infrared (VNIR) and short-wave infrared spectral range (SWIR). Sentinel-2 data is available in ESA Copernicus Open Access Hub (https://scihub.copernicus.eu). There is no NRT data from Sentinel-2 with the latency less than 3 hours.

References

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