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Sen2Cor Version 3.0 Processor Applied to Landsat-8 Data: Implementation and Preliminary Results

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Sen2Cor 2.10

- Official ESA Copernicus Sentinel-2 Level-2A Processor
- Available to the public as a stand-alone Processor (QR code below)
- Generates Level-2A Bottom-Of-Atmosphere reflectance products
- Features: Surface Reflectance Product, via Atmospheric Correction, together with Scene Classification map, Aerosol and Water Vapour maps.
- See Poster: *Sen2Cor Version 2.10, Last Evolution and Focus on the update of Cloud Screening and Scene Classification* (Jérôme Louis)

Sen2Cor 3.0

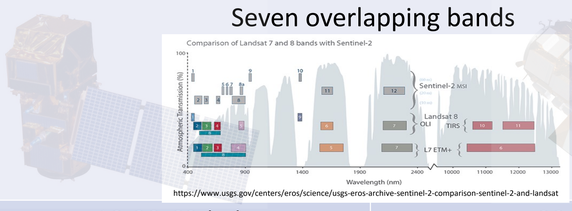
- Evolution of Sen2Cor 2.10 (Python 3)
- Mirrors the Sen2Cor 2.10 Resulting Products
- Belongs to the *Sen2Like* Framework (QR code below)
- Processes L1C Copernicus Sentinel-2 and L1 LANDSAT-8(9) products
- Base for future processing of products from additional Satellites and Missions

Sentinel-2 vs Landsat-8

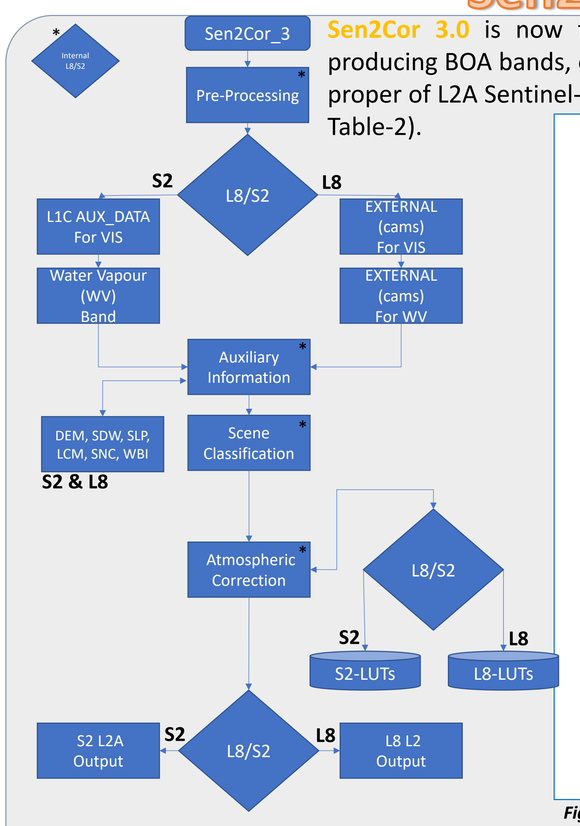
- **Sentinel-2** and **Landsat-8** have six overlapping spectral bands. Their measurements are often complementary used for studying and monitoring, for example, the status and variability of the Earth's vegetation and land conditions.
- There are also important differences (See Table-1) between these two sensors, such as the spectral-band response, spatial resolution, viewing geometries and calibrations. These differences and quantities are all reflected in their resulting L1 products. A dedicated handling process for those differences is needed.
- Contrary to **Sentinel-2**, **Landsat-8** does not have the Sentinel-2 water-vapour sensitive band B09 (at 60 m) used by Sen2Cor to retrieve the estimate of the water vapour content of the atmosphere. Therefore, in order to perform the atmospheric correction of Landsat products, the water vapour information needs to be retrieved by another way.
- New set of Look-Up Tables had to be prepared.

Table-1: Overview of Sentinel-2 and Landsat-8 key characteristics

	Sentinel-2	Landsat-8
Instrument(s)	MSI	OLI (TIRS)
Bands	Seven overlapping bands	
Resolution	10-20-60 (m)	30 (m)
Sensing Time	Different	
Bands' Response	Different	
Viewing Geometry	Different	
Water Vapour Band	YES	external source (CAMS)
L1C AUX_INFO	YES	external source (CAMS)
Look-up Tables	Dedicated LUTs	New Dedicated LUTs



Sen2Cor 3.0



Sen2Cor 3.0 is now fully capable of processing **Landsat-8(9)** L1 products producing BOA bands, optional and additional output (e.g. L2A Quality reports) proper of L2A Sentinel-2 products processed by **Sen2Cor 2.10** (see Figure 1 and Table-2).

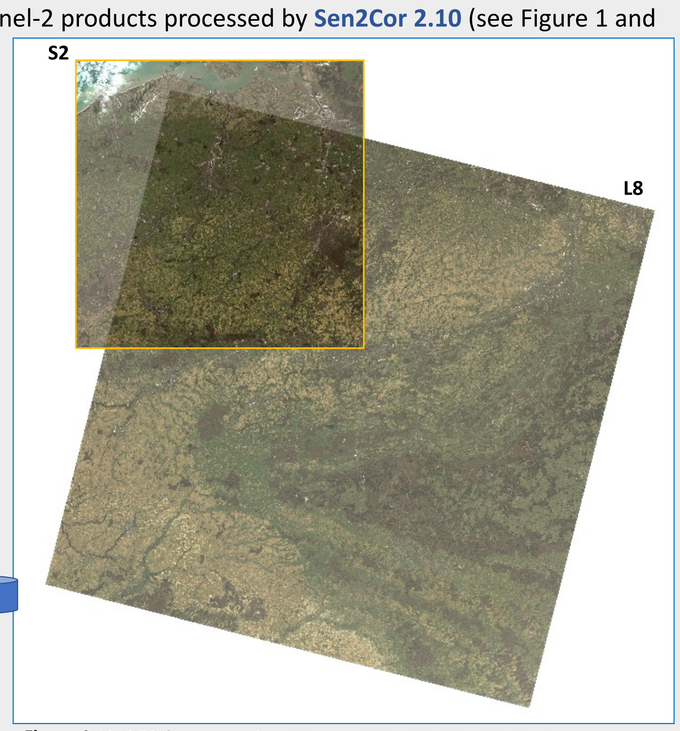


Figure-1: L8 L2 TCI from processing LC08_L1TP_198025_20210224_20210224_01_RT
S2 L2A TCI from processing S2A_MSIL1C_20210224T105031_N0209_R051_T31UES_20210225T161421

Table-2: List of resulting Sentinel-2 and Landat-8 L2 ouput** produced by Sen2Cor 3.0

	L2A	B01	B02	B03	B04	B05	B06	B07	B08	B09	B10	B11	B12
S2	20↔ m	NA	YES	YES	YES	YES	YES	YES	(B8A)	NA	NA	YES	YES
L8	30 m	YES	YES	YES	YES	YES	YES	YES	L1 (B08)	NA	L1	L1	NA

	L2	SCL	CLD	DDV	WVP	DEM	TCI	AOT	VIS	SNW	L2A_Quality.xml	MTD
S2	20 m	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
L8	30 m	YES	YES	YES	YES	YES	YES	YES	NA	YES	YES	YES

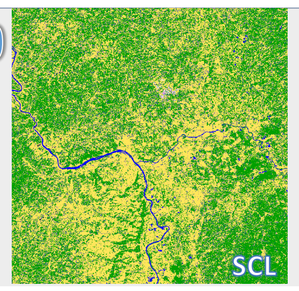
**Sen2Cor L2A product includes 10, 20 and 60 m processing (depending on the initial setting)

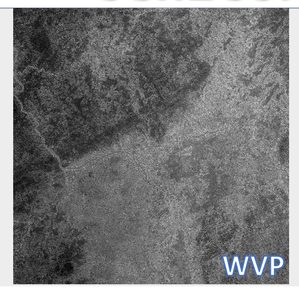
Sen2Cor 2.10 vs Sen2Cor 3.0

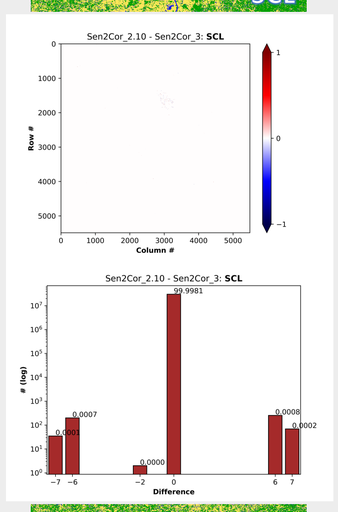
Sen2Cor 2.10

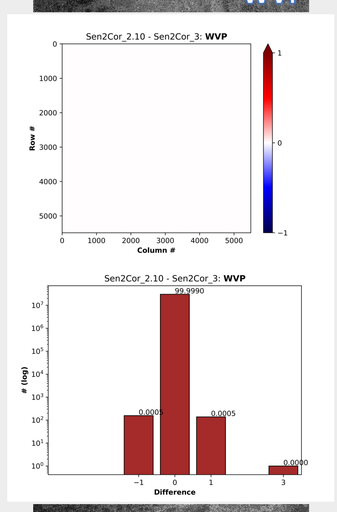
S2B_MSIL1C_20220228T102849_N0400_R108_T32UMA_20220228T123819.SAFE

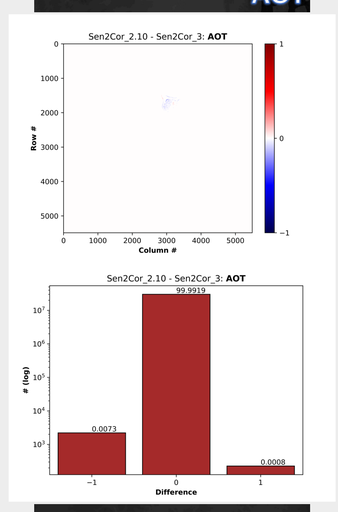
L1C AUX_DATA
DEM (srtm)

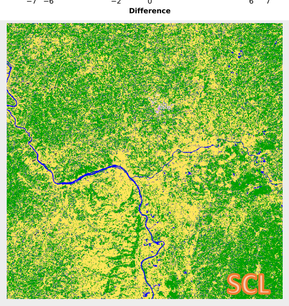


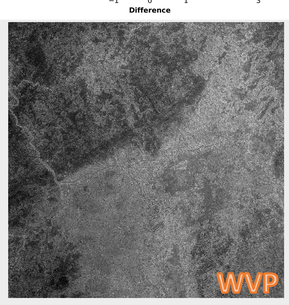


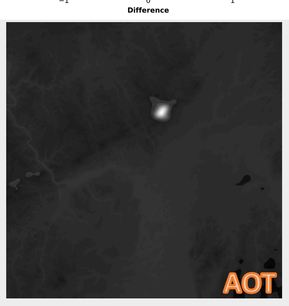




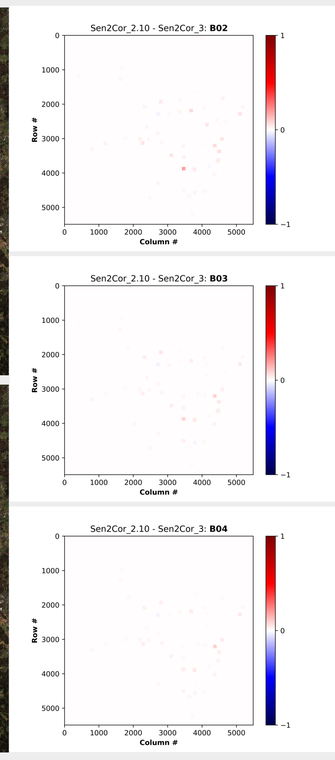


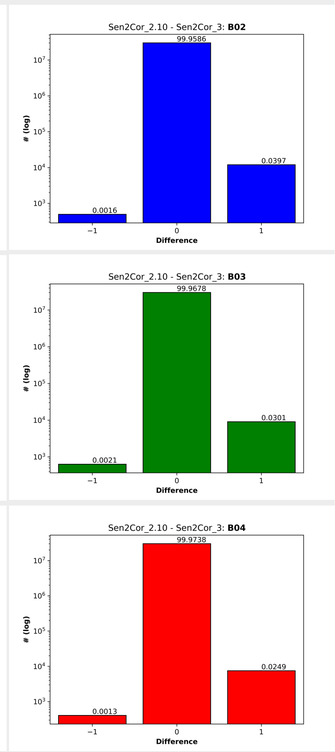






Sen2Cor 3.0





Preliminary comparison between L2A products processed by **Sen2Cor 2.10** and **Sen2Cor 3.0** shows really good agreement between their resulting BOA bands' reflectance and associated auxiliary products (~0.99) .Further assessment is in progress to verify and validate the LANDSAT-8 resulting L2 products.

Sen2Cor processor can be downloaded from:
http://step.esa.int/main/third-party-plugins-2/sen2cor/

Sen2Like Github page:
https://github.com/senbox-org/sen2like

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