



**GAFAG**

# **Sentinel-2 Facts and Figures**

Vilnius/LITHUANIA, 3-7 July, 2017

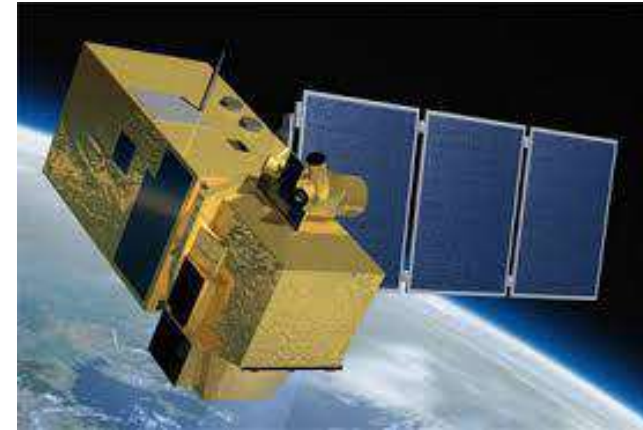
Alexander Klaus

GAF AG

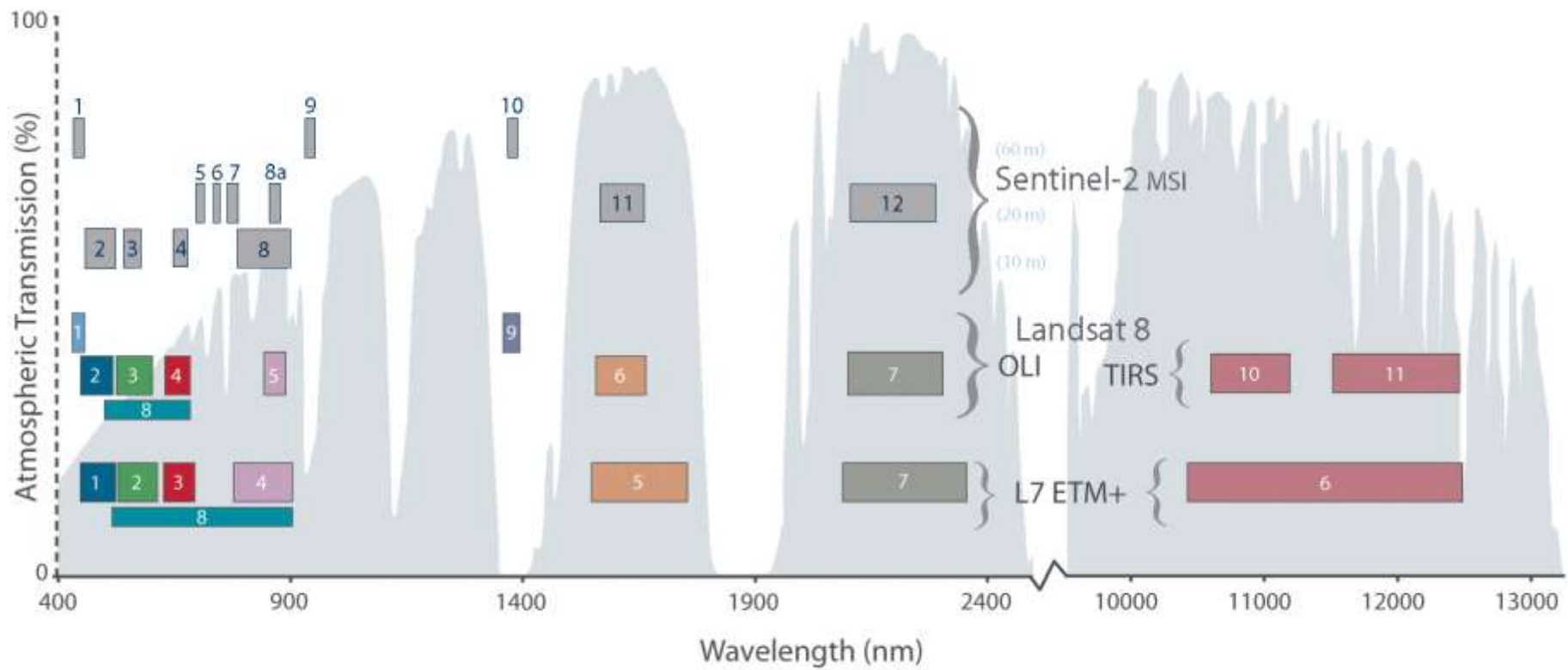
## Sentinel-2

- **Start:** Sentinel-2A June 2015, Sentinel-2B March 2017 (but not yet operational)
  - **Orbit:** Polar, Sun-Synchronous at 786 km altitude
  - **Revisit time:** Five days with two satellites (at equator)
  - **Design life:** 7 years
  - **Instrument:** Multispectral imager (MSI) with 13 spectral bands (443 nm–2190 nm),

<b>Swath:</b>	290km
<b>Spatial resolution:</b>	10 m (4 visible and NIR- bands) 20 m (6 red- edge/ SWIR bands) 60 m (3 atmospheric correction bands)
<b>Radiometric resolution :</b>	12 bit (4096 DN's)
- Accuracy:** CE95 of <12,5m



Comparison of Landsat 7 and 8 bands with Sentinel-2



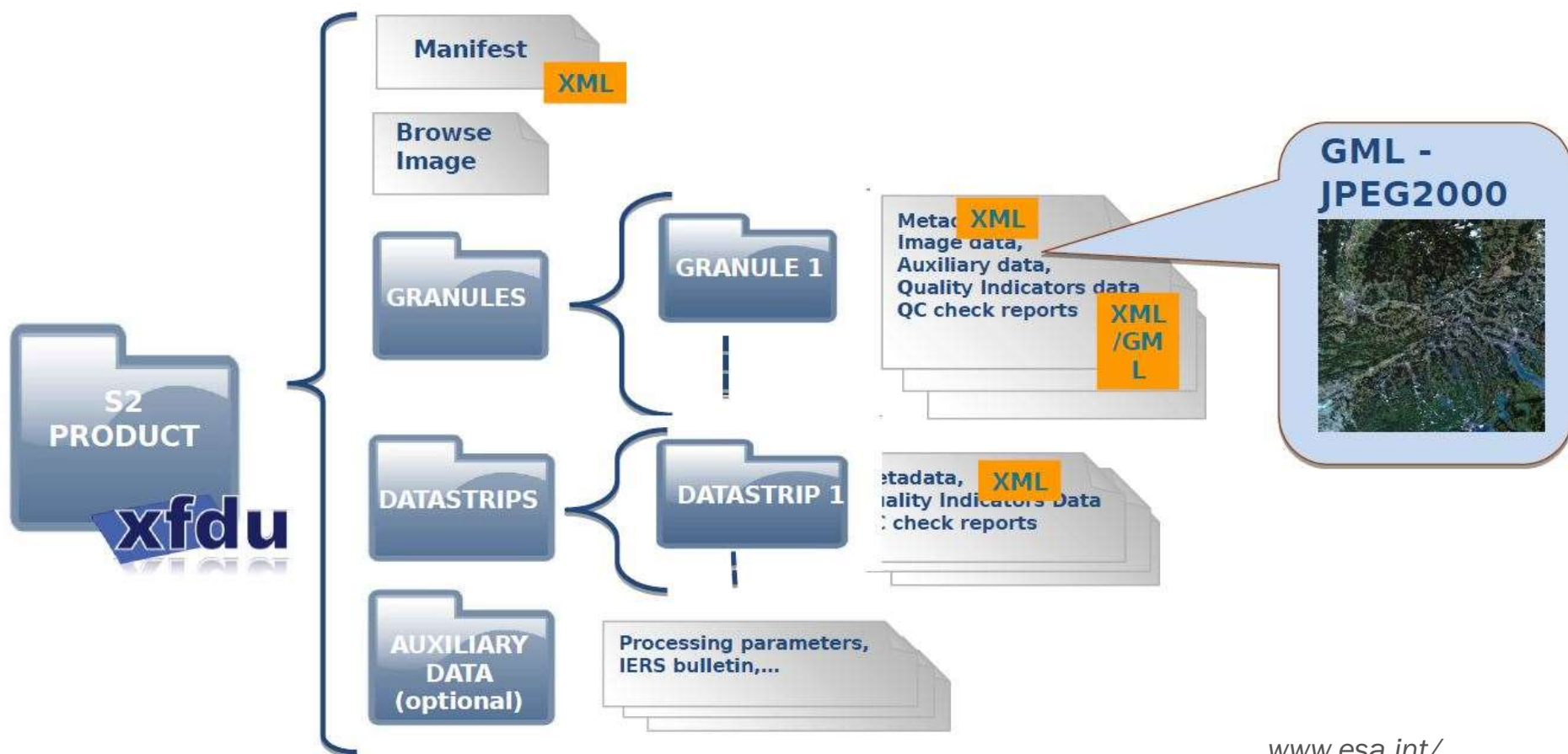
## MSI Bands

The MSI **Spectral Bands** span from the Visible and the Near Infra-Red to the Short Wave InfraRed:

Band number	Central wavelength (nm)	Bandwidth (nm)	Lref (reference radiance) (W m <sup>-2</sup> sr <sup>-1</sup> μm <sup>-1</sup> )	SNR @ Lref
<b>10 m Spatial Resolution Bands and associated Signal to Noise ratio (SNR)</b>				
2 (Red)	490	65	128	154
3 (Green)	560	35	128	168
4 (Blue)	665	30	108	142
8 (NIR)	842	115	103	172
<b>20 metre Spatial Resolution Bands and associated Signal to Noise ratio (SNR)</b>				
5 (RedEdge)	705	15	74.5	117
6 (Vegetation RedEdge)	740	15	68	89
7 (Vegetation RedEdge)	783	20	67	105
8a (Vegetation RedEdge)	865	20	52.5	72
11 (SWIR1)	1 610	90	4	100
12 (SWIR2)	2 190	180	01. Mai	100
<b>60 metre Spatial Resolution Bands and associated Signal to Noise ratio (SNR)</b>				
1 (Coastal Blue)	443	20	129	129
9 (Water Vapour)	945	20	9	114
10 (SWIR – Cirrus)	1 375	30	6	50



























- The **Level-0 (consolidated)** product corresponds to raw images still on board compressed.
- The **Level-1** products are generated from the Level-0 product:
  - Level-1A : "Raw Image" after decompression,
  - Level-1B : "Radiometrically corrected." product with geometric model refined appended but not applied,
- **Level-1C : Orthorectified product (geometric ortho-correction taking into account a DEM) providing Top Of Atmosphere Reflectances.**
- The **Level-2A** prototype product is an orthorectified product providing Bottom-Of-Atmosphere reflectances, and basic pixel classification (including classes for different types of cloud) (cf. [L2A-PDD]). The generation of this prototype product will be triggered “interactively” by the PDGS users based on S2MSI1C products but it will not be systematically generated. This document does not cover the Level-2A product specifications.

## Sentinel-2 product format



[www.esa.int/](http://www.esa.int/)



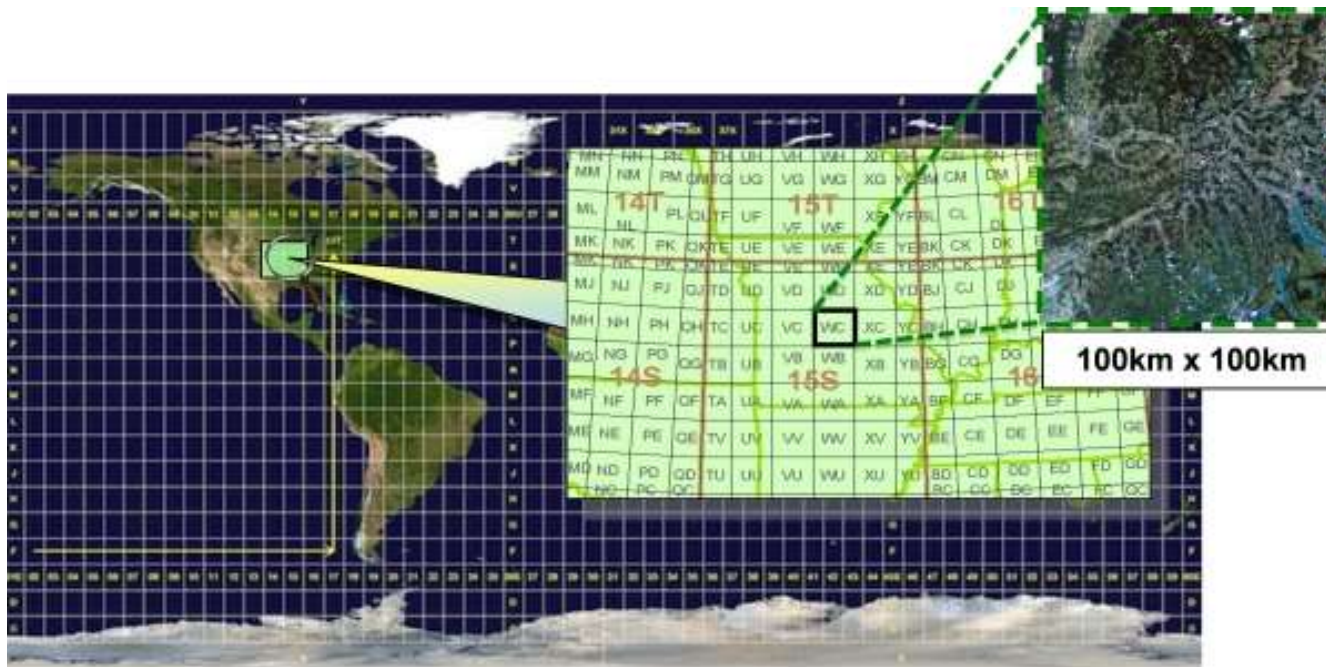
 S2A_OPER_PRD_MSIL1C_PDMC_20160113T194607_R065_V20160113T104010_20160113T104010	 S2A_OPER_PRD_MSIL1C_PDMC_20160113T194607_R065_V20160113T104010_20160113T104010.SAFE
 AUX_DATA	
 DATASTRIP	
 S2A_OPER_MSIL1C_DS_SGS_20160113T160447_S20160113T102957_N02.01	
 QI_DATA	
 GRANULE	
 S2A_OPER_MSIL1C_TL_SGS_20160113T160447_A002922_T31SFA_N02.01	
 AUX_DATA	
 IMG_DATA	
 QI_DATA	
 S2A_OPER_MSIL1C_TL_SGS_20160113T160447_A002922_T31SFB_N02.01	
 S2A_OPER_MSIL1C_TL_SGS_20160113T160447_A002922_T31SFV_N02.01	
 S2A_OPER_MSIL1C_TL_SGS_20160113T160447_A002922_T31SGA_N02.01	
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 S2A_OPER_MSIL1C_TL_SGS_20160113T160447_A002922_T32SKE_N02.01	
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 S2A_OPER_MSIL1C_TL_SGS_20160113T160447_A002922_T32SLG_N02.01	
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 S2A_OPER_MSIL1C_TL_SGS_20160113T160447_A002922_T32SMG_N02.01	
 HTML	
 rep_info	

The Level-1C User product consists of:

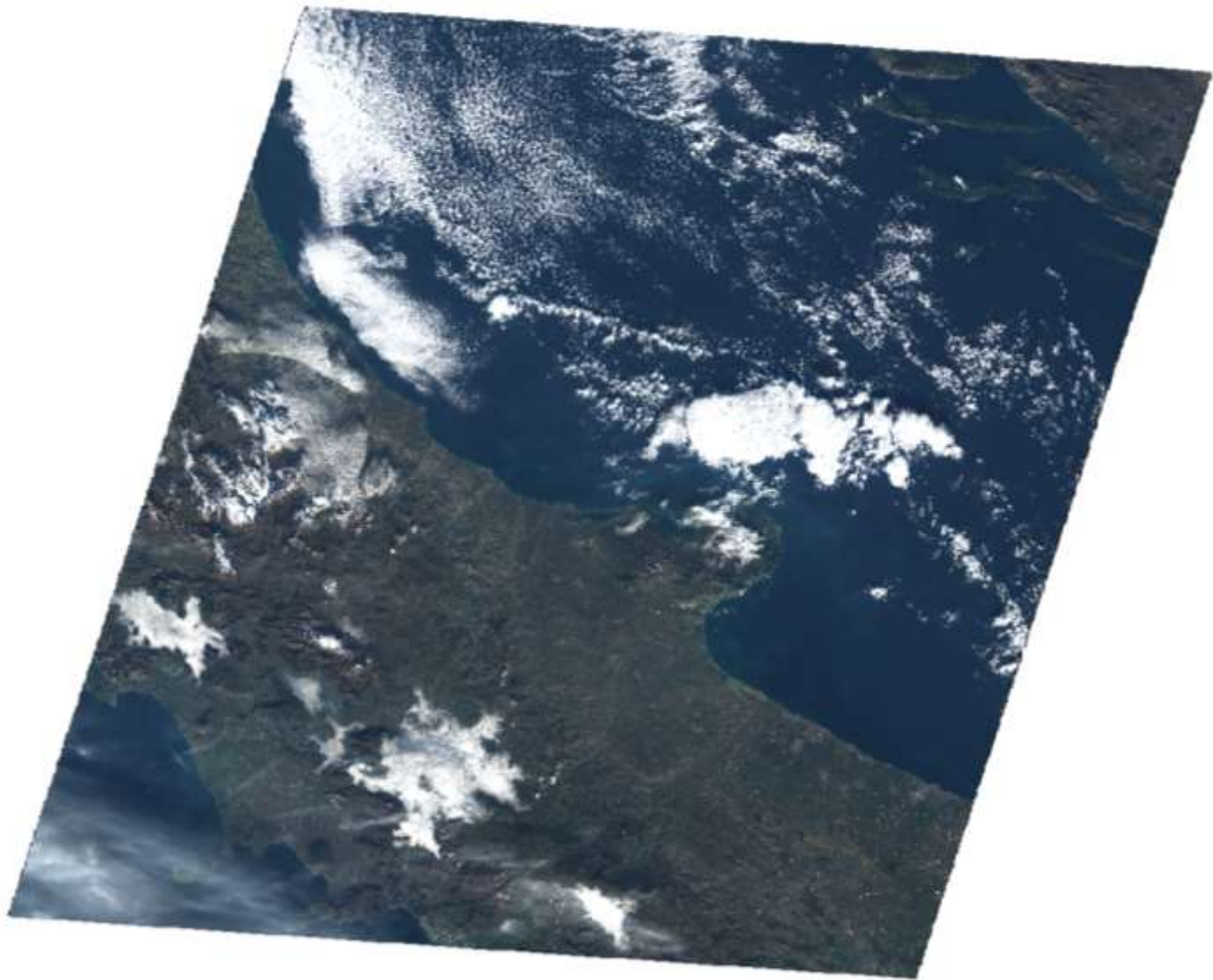
1. **Product\_Metadata\_File**: mandatory XML main metadata file.
2. **manifest.safe**: SAFE metadata file (optional). It is included in the product only if the user requests the SAFE as output format (download option).
3. **GRANULE**: this folder (the name is chosen for homogeneity with respect to the other User Product but should be TILE) contains the tiles composing the product (Image Data). The Image Data corresponds to a set of Tiles containing one image file per band. A sub-set of the 13 bands can be provided (download option).
4. **DATASTRIP**: folder containing the Datastrip composing the product linked to the selected tiles.
5. **AUX\_DATA**: folder containing, if requested by the user (download option), the GIPP files and IERS Bulletins used for the Level-1C User Product production. All Level-1C auxiliary data are referenced in the product metadata file. In addition, the Level-1C User Product embeds always at GRANULE (TILE) level an elementary set of meteorological datasets resampled ECMWF in tile geometry.
6. **Browse\_Image**: PNG file consisting of an image limited to 3 visible-bands in ground geometry at 320m resolution. This file, provided if requested by the user (download option), gives an overview of the product (sub-sampled) mainly for image data browsing and selection purposes,
7. **rep\_info**: folder containing the XSD schema provided inside the product. This folder is optional. It will be included in the User Product if the user selects the SAFE format as output format (cf. section 1.6.4).
8. **INSPIRE**: XML INSPIRE metadata file (cf. Annex B).
9. **HTML**: folder containing an HTML product presentation file (UserProduct\_index.html) and the corresponding stylesheet (UserProduct\_index.xsl).



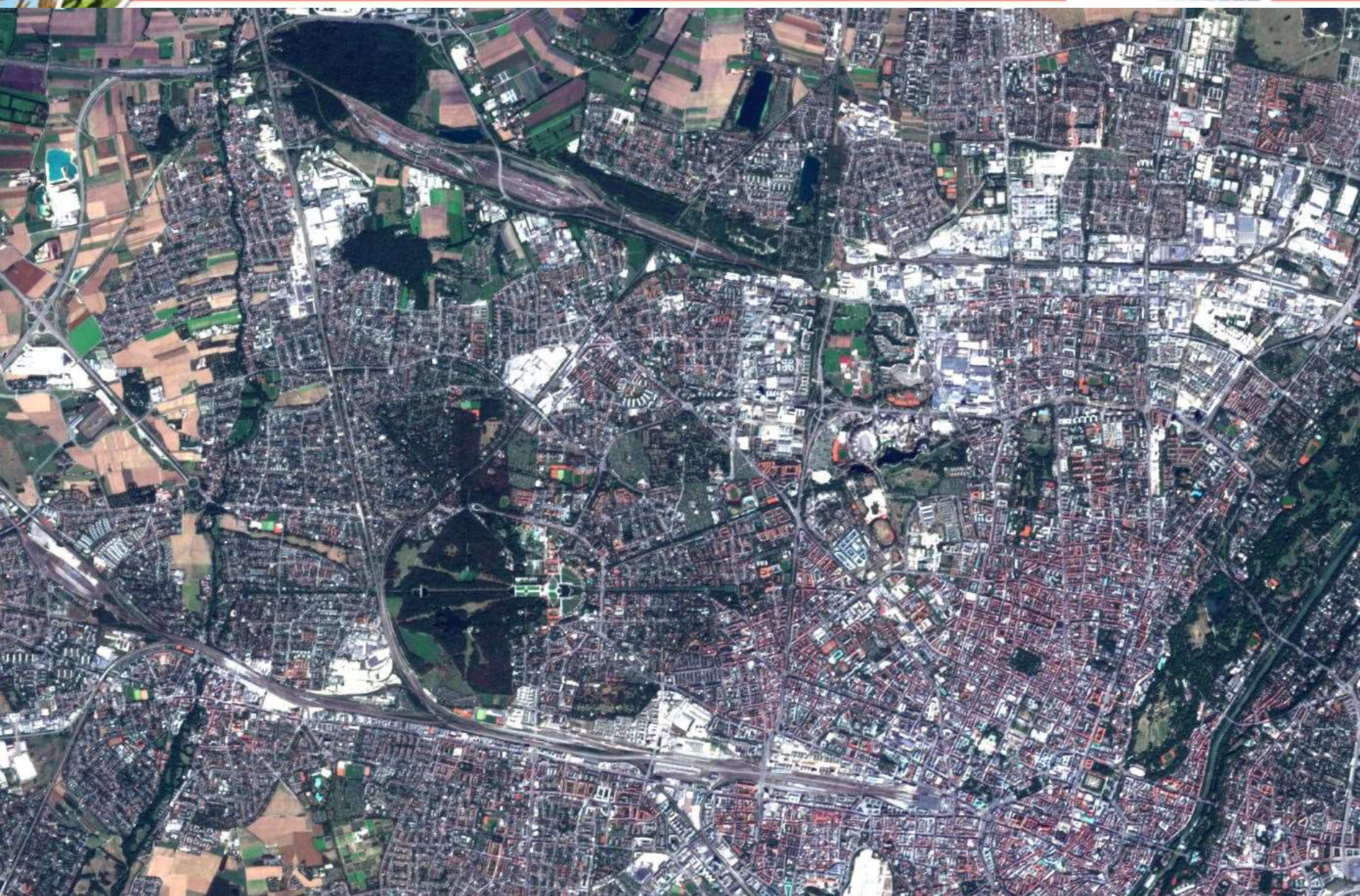
For Level-1C and Level-2A, the granules, also called tiles, are 100x100km<sup>2</sup> ortho-images in UTM/WGS84 projection. The UTM (Universal Transverse Mercator) system divides the Earth's surface into 60 zones. Each UTM zone has a vertical width of 6° of longitude and horizontal width of 8° of latitude. (see Figure 1). Tiles are approximately 500 MB in size. Tiles can be fully or partially covered by image data. Partially covered tiles correspond to those at the edge of the swath. Each image file is compressed using the JPEG2000 algorithm



Level-1C Tiling Concept in UTM

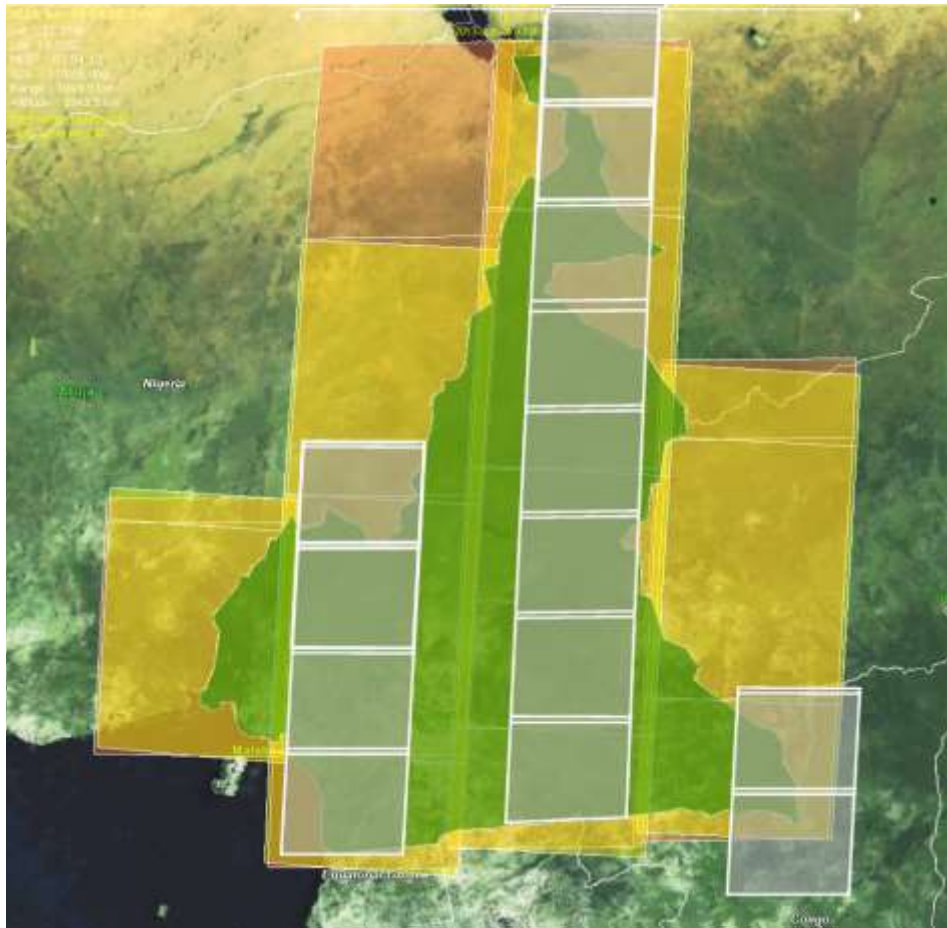








# Landsat / Sentinel-2 coverage in Cameroon (10 days simulation)



Landsat

Landsat &  
Sentinel 2A

Landsat &  
Sentinel 2A &  
Sentinel 2B

### ESA Data Hubs:

- Copernicus Open Access Hub:  
<https://scihub.copernicus.eu/s2/#/home>
- Copernicus Services Data Hub:  
<https://scihub.copernicus.eu/dhus>

### USGS Earth Explorer:

<https://earthexplorer.usgs.gov/>

### National data archives:

CODE-DE (German Sentinel entry point:

<https://code-de.org/en>

PEPS (French Access to the Sentinel Products):

<https://peps.cnes.fr/rocket/#/home>

### Private sector:

- REMOTE PIXEL:  
<https://www.remotepixel.ca/projects/satellitesearch.html>
- Amazon Web Service:  
<http://sentinel-s2-l1c.s3-website.eu-central-1.amazonaws.com/#>



Insert search criteria...

Advanced Search Clear

» Sensing period From: [calendar icon] to: [calendar icon]

» Ingestion period From: [calendar icon] to: [calendar icon]

☐ Mission: Sentinel-1

Product Type (SLC, GRD, OCN) Polarisation (e.g. HH, VV, HV, VH...)

Sensor Mode (SM, IW, EW, WV) Relative Orbit Number (from 1 to 175)

☒ Mission: Sentinel-2

Cloud Cover % (e.g. [0 TO 94])

07.07.2017

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<https://scihub.copernicus.eu/dhus/#/home>

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 S2A\_OPER\_PRD\_MSIL1C\_PDMC\_20160106T212105\_R100\_V20160106T103956\_20160106  
Download URL: <https://scihub.copernicus.eu/ftp/data/MSI/Products/016d23e3-8f2c-4577-94>  
Mission: Sentinel-2 Instrument: MSI Sensing Date: 2016-01-06T10:39:56.000Z Size: 6.54 GB

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