Answers - GLaSS Training material, Lesson #1

Part 1 Access to Sentinel 2, 3 and Landsat

If you want images with at least 75% of clear pixels, which cloud percentage would you indicate for the cloud cover filter?

You have to indicate that the images should not have more than 25% of cloud coverage.

Could you identify in the name of the file below, when the Sentinel two data was taken? You can search for help in the S2-MSI Product Specifications document.

S2A_OPER_PRD_MSIL1C_PDMC_20160112T200934_R051_V20160112T110648_20160112T110648

The image was taken on the 2016-01-12 at 11:06:48. The other date that appears before refers to the day the data was processed (2016-01-12 at 20:09:34).

On which path/row can you find these lakes in one scene?

The lakes Lake Constance and Illmensee are recorded together on path 194 and row 27. Lake Constance is also partly covered in its north-western part in path 195 row 27.

What is the cloud coverage of the Landsat 8 image from 2014-08-04 as specified in the metadata file?

The cloud coverage is 36.64%.This value can also be read from the metadata viewer in the GLOVIS portal by right clicking on the image selected.

Part 2 Discover the specifications of Sentinel 2, 3 and Landsat

Where can you find in the data and which one is the product start time?

⊟ Product_Info		
⊞ Datatake		
⊞ Query_Options		
⊞ Product_Organisation		
PRODUCT_START_TIME	2015-12-11T05:27:24.615Z	ascii
PRODUCT_STOP_TIME	2015-12-11T05:27:24.615Z	ascii
PRODUCT_URI	404_2015-12-11T13_48	ascii
PROCESSING_LEVEL	Level-1C	ascii
PRODUCT_TYPE	S2MSI1C	ascii
PROCESSING_BASELINE	02.00	ascii
GENERATION_TIME	2015-12-11T13:54:17.000698Z	ascii
PREVIEW_IMAGE_URL	https://pdmcdam2.sentinel2.eo.esa.int/s2pdgs_geoserver/g	ascii
PREVIEW_GEO_INFO	BrowseImageFootprint	ascii
⊞ Product_Image_Characteristics		

The start and end time information is available in the Product Explorer, selecting product name and clicking in the metadata. The metadata file can be open with a double click an a table with the metadata information is shown in the SNAP view. Look inside the Product_Organisation for the PRODUCT_START_TIME and PRODUCT_STOP_TIME.

PRODUCT_START_TIME = 2015-12-11T05:27:24.615Z

Display an RGB and overlay the pixels flagged as cloud with the cloud mask. Which surfaces are flagged as cloud?

The surface masks are clouds are the very dense and bright clouds easily to see in the image, but also some snow pixels are flagged as clouds, which indicates that there is an inaccuracy in the flag definition.

What is the Top of Atmosphere Radiance of the pixel coordinate UTM 32N 552695 E, 5264153 N (Lat /Lon WGS 84:47°31'43.1976'' N, 9°42'0.2124'' E)?

For the pixel value of 5765 in band 5 of the scene from 2014-08-04, the TOA radiance is 4.5437105 according to the formula provided by USGS.

$$L_\lambda = 0.0059397 * 5765 + (-29.69866)$$

Further, Top of Atmosphere Reflectance can be calculated using the formula

$$\rho\lambda' = M_\rho * Q_{cal} + A_\rho$$

where:

$\rho\lambda'$ = Top-of-Atmosphere Planetary Spectral Reflectance, without correction for solar angle. (Unitless)

M_ρ = Reflectance multiplicative scaling factor for the band (REFLECTANCEW_MULT_BAND_n from the metadata).

A_ρ = Reflectance additive scaling factor for the band (REFLECTANCE_ADD_BAND_N from the metadata).

Q_{cal} = Level 1 pixel value in D (source: http://landsat.usgs.gov/l8handbook_section5.php)

References

USGS 2015: Landsat 8 (L8) Data users Handbook. Version 1.0
Online accessed (January 2015): http://landsat.usgs.gov/l8handbook_section5.php