Satellite imagery downloader

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Objective

Use high-resolution satellite imagery to provide a picture of the land cover around each GRUAN site through Python software, as follows:

Key	Name
ALC	Alice Springs
BAR	Barrow
BEL	Beltsville
BOU	Boulder
CAB	Cabauw
DAR	Darwin
DLG	Dolgoprudny
DVS	Davis
GRA	Graciosa
GVN	Neumayer
HKO	Hong Kong
LAU	Lauder
LIN	Lindenberg
MAQ	Macquarie Island
MEL	Melbourne
MTS	Minamitorishima
NYA	Ny-Ålesund
PAY	Payerne
PMO	Paramaribo
POT	Potenza
REU	La Réunion
ROS	Ross Island
SGP	Lamont
SNG	Singapore
SOD	Sodankylä
SYO	Syowa
TAT	Tateno
TEN	Tenerife
TRP	Trappes Palaiseau
XIL	Xilinhot

Inputs:

1. Lat and Long of the top-left corner;

2. Lat and Long of the bottom-right corner;

3. Image resolution.

(40.606856 °N, 15.713995 °E)

POT (40.6 °N, 15.72 °E)

1

3

2

0.30 m/pixel

(40.595937 °N, 15.736250 °E)

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Satellite technical specifications

- The Python software works with any raster map that uses **Web Mercator** (de facto standard for web mapping applications), including Google Maps, Esri, OpenStreetMap and many others.

- **Default satellite** used in the software: **Google Maps** satellite imagery (https://mt.google.com/vt/lyrs=s&x={x}&y={y}&z={z}).

- **Additional satellites** that can be used in the software:

  o **OpenStreetMap** (https://tile.openstreetmap.org/{z}/{x}/{y} or https://tile.osmand.net/df/{z}/{x}/{y});

  o **Esri** satellite imagery (https://services.arcgisonline.com/arcgis/rest/services/World_Imagery/MapServer/tile/{z}/{y}/{x})

- **Map data update**: the map is updated constantly – every second of every day – collecting new information, whether from satellite imagery or Street View cars.

- **Software data policy**: MIT License, Copyright © 2022 andolg.

Images technical specifications

- **Image resolution**: 19 different levels, as shown in the table on the right (For more information see: https://learn.microsoft.com/en-us/bingmaps/articles/understanding-scale-and-resolution);

- **Image format**: PNG;

- **Image size**: depending on the chosen resolution and the selected area.

Zoom Level	Scale (m/pixel)	Zoom Level	Scale (m/pixel)
1	78271.52	11	76.44
2	39135.76	12	38.22
3	19567.88	13	19.11
4	9783.94	14	9.55
5	4891.97	15	4.78
6	2445.98	16	2.39
7	1222.99	17	1.19
8	611.50	18	0.60
9	305.75	19	0.30
10	152.87		

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Additional satellite image download software

The following software were also used to download satellite images:

- **SENTINEL API** (https://github.com/dlecorre387/Sentinel2ImageDownload?tab=readme-ov-file);

- **Google Earth Engine** (https://earthengine.google.com/)

Currently, we chose to use the Python software presented for downloading satellite images because it is considered the most efficient.

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Thank you for your attention!