# Product: Hyperspectral Infrared Core Imaging Data (unprocessed, level 0)

## List of changes

Listing of changes in the product or the product description.
Product version was intruduced in connection with the implementation of the Commision Implementing Regulation 2913/138 of 21 December 2022.

**List of changes**

| Document version | Product version | Approval data | Changes |
|---|---|---|---|
| 1.0 | | 2015-04-20 | First published version |
| 2.0 | 1.0 | 2024-06-09 | Provided according to EU-commission regulation about valuable datasets. New open license and distribution of borehole data by the product Borrhål (Boreholes) |

## Short description

The data comprise unprocessed raw data (level 0 data) containing image and spectral data acquired by scanning of drill cores at SGU. Level 0 is typically the level at which raw hyperspectral data is captured during the scanning campaign and the data has not been processed i.e. no data correction, normalization or band subsetting has been performed on this data.

The cameras in the scanner cover the visible-near infrared and short-wave infrared (VNIR-SWIR) and the long-wave infrared (LWIR). The combination of different infrared wavelength ranges increases the mineral detection capability. Objective information about the mineralogical composition of the drill cores is fundamental basics for interpretation and modeling of the rock and the geological evolution.

Raw data can be processed further to generate products to be used in the interpretation of the composition of the drill cores. Information about the mineralogy of the drill cores is fundamental base for interpretation and modeling of the rock and the geological evolution. The results may increase the knowledge about mineral forming processes which in turn may facilitate a better use of Sweden's mineral resources. Data from the project may also have other uses, e.g. in mineral-related research.

Potential users of the data are exploration and mining companies, consultants, researchers and students.

## Distribution

License: CC0 1.0 Universal

The product is provided as compressed zip-files containing data per borehole. Links to the downloadable files are accessed by the SGU product Borrhål (Borehole), either by downloading a pre-packaged GeoPackage database for use in a GIS-client, or by direct acces by an API.

Additional information on the SGU products Borrhål (Borehole) is available here (not translated) https://www.sgu.se/produkter-och-tjanster/geologiska-data/malmer-och-mineral--geologisk-data/borrkarnor-och-borrhal/

## Content of the delivery

Format: RAW (BIL), JPEG, ASCII, XML, XSL

Level 0 data includes metadata, calibrations and images from optical camera (RGB) and image files from the visible-near infrared and short-wave (VNIR-SWIR) – and long-wave (LWIR) infrared cameras.

The folder structure, including the subfolders and files of the delivery is explained below.

## Background

During 2014, SGU started a project to scan 200 000 meters of drill core at the drill core archive in Malå. The drill cores to be scanned in the project are from Norrbotten and Västerbotten. The scanning project aims at creating a database of optical and infrared data that can be used for virtual drill core mapping and will be a complement to the physical core that is stored at the national drill core archive in Malå. Scanning is performed by the companies SPECIM, Spectral Imaging Ltd. and GeoSpectral Imaging Ltd. Included in the assignment is high resolution optical photography and hyperspectral infrared imaging.

Hyperspectral infrared core imaging is a passive non-destructive technique that measures reflected infrared light from the drill core surface. The cameras in the scanner cover the visible-near infrared and short-wave infrared (VNIR-SWIR) and the long-wave infrared (LWIR). The combination of different infrared wavelength ranges increases the mineral detection capability. Different minerals have characteristic features across different wavelength ranges of the electromagnetic spectrum. The infrared is considered as a good detection technology because a wide range of minerals have characteristic signatures in these wavelength ranges. A high-resolution optical photo is also produced.

The scanner that is used in the project is sisuRock which is a fully automated hyperspectral imaging instrument for high-speed scanning of drill cores and other geological samples. Raw data is image and spectral data acquired during the scanning process. It usually does not involve any data processing; however fundamental quality control steps are taken at this stage to ensure a complete and comprehensive data set.

## Maintenance

At present no scanning of drill cores is carried out at SGU.

## Data quality

Although level 0 data usually does not involve any data processing, fundamental quality control steps are taken at this stage to ensure a complete and comprehensive data set. Typical tasks include:

- Ensuring image data is complete and correct
- Image data and quality review, including calibration files
- Filename and file format quality control
- Metadata review ensuring captured data is correct and accurate

## Content and structure

Data from each drill core is stored in a top-level folder that is named with a unique ID that identifies the drill core. This ID is similar to the IDCODE used in the SGU drill core database, for example "BJT72222".

Each drill core folder further contains several subfolders and files. Directly under the top-folder there are three subfolders i.e. one folder for each of the sensors RGB, LWIR, and VNIR-SWIR. For each of these three sensors, each individual core box that makes up the drill core is stored in its own subfolder designated with a numeric suffix that increases downhole, e.g. "BJT72222_1" is the first core box of the drill core "BJT72222".

### RGB

Each core box folder contains two subfolders (named "capture" and "metadata").

The "capture" folder contains the raw image file of the core box. Raw data is delivered as BIL files compatible with ENVI. The raw image file is accompanied by a header file in ASCII format.

Example of level 0 data files included in the "capture" folder of the RGB camera.

| Filename | Format | Content |
|---|---|---|
| BJT72222_2_8m37_16m61_2014-10-30_10-32-26.hdr | ASCII | Header file of BIL file with the same name. |
| BJT72222_2_8m37_16m61_2014-10-30_10-32-26.raw | BIL | ENVI compatible image containing raw data |
| DARKREF_BJT72222_2_8m37_16m61_2014-10-30_10-32-26.hdr | ASCII | Header file of BIL file with the same name. |
| DARKREF_BJT72222_2_8m37_16m61_2014-10-30_10-32-26.raw | BIL | ENVI compatible image containing raw data |
| WHITEREF_BJT72222_2_8m37_16m61_2014-10-30_10-32-26.hdr | ASCII | Header file of BIL file with the same name. |
| WHITEREF_BJT72222_2_8m37_16m61_2014-10-30_10-32-26.raw | BIL | ENVI compatible image containing raw data |

Example of level 0 data files included in the "metadata" folder of the RGB camera.

| Filename | Format | Content |
|---|---|---|
| BJT72222_2_8m37_16m61_2014-10-30_10-32-26.xml | XML | Metadata |
| BJT72222_2_8m37_16m61_2014-10-30_10-32-26.xsl | XSL | Stylesheet |

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## *LWIR and VNIR-SWIR*

Each core box under LWIR and VNIR-SWIR contain four subfolders (named "calibrations", "capture", "jpegs", "metadata"). The folder structure and filenames for the LWIR and VNIR-SWIR cameras are identical:

- The "calibrations" folder is empty for level 0 data.
- The "capture" folder contains the raw data files for the core box. Raw data is delivered as BIL files, compatible with other data viewing and querying software packages such as ENVI. The raw image file is accompanied by a header file in ASCII format.
- The "jpegs" folder contains QAQC image from scanning
- The "metadata" folder contains an XML metadata file

Example of level 0 data files included in the "capture" folder of the LWIR and VNIR-SWIR camera.

| Filename | Format | Content |
|---|---|---|
| BJT72222_2_8m37_16m61_2014-10-30_10-32-26.hdr | ASCII | Header file of BIL file with the same name. |
| BJT72222_2_8m37_16m61_2014-10-30_10-32-26.raw | BIL | ENVI compatible image containing raw data |
| DARKREF_BJT72222_2_8m37_16m61_2014-10-30_10-32-26.hdr | ASCII | Header file of BIL file with the same name. |
| DARKREF_BJT72222_2_8m37_16m61_2014-10-30_10-32-26.raw | BIL | ENVI compatible image containing raw data |
| WHITEREF_BJT72222_2_8m37_16m61_2014-10-30_10-32-26.hdr | ASCII | Header file of BIL file with the same name. |
| WHITEREF_BJT72222_2_8m37_16m61_2014-10-30_10-32-26.raw | BIL | ENVI compatible image containing raw data |

Example of level 0 data files included in the "jpegs" folder of the LWIR and VNIR-SWIR camera.

| Filename | Format | Content |
|---|---|---|
| **QAQC_REPORT_BJT72222_2_8m37_16m61_2014-10-30_10-32-26.jpg** | JPEG | QAQC image from scanning |

Example of level 0 data files included in the "metadata" folder of the LWIR and VNIR-SWIR camera

| Filename | Format | Content |
|---|---|---|
| BJT72222_2_8m37_16m61_2014-10-30_10-32-26.xml | XML | Metadata |
| BJT72222_2_8m37_16m61_2014-10-30_10-32-26.xsl | XSL | Stylesheet |