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PRODUCT: HYPERSPECTRAL INFRARED CORE IMAGING DATA (PROCESSED, LEVEL 2)

Short description

The data comprise image and spectral data acquired by scanning of drillcores at SGU. The cameras in the scanner cover the visible, short wavelength and long wavelength parts of the infrared spectrum. The combination of different infrared wavelength ranges increases the mineral detection capability. Objective information about the mineralogical composition of the drillcores is fundamental basics for interpretation and modeling of the rock and the geological evolution.

Level 2 is a processing level where data has been prepared for further spectral processing and product generation. Note that mineral identification is not included in level 2. This requires further processing and interpretation of the data.

Data format: RAW (BIL), JPEG, TIFF, ASCII, XML

Contents of the delivery

Level 2 data includes metadata, 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 under the heading “Structure”.

Background

During 2014, SGU started a project to scan 200 000 meters of drillcore at the drillcore archive in Malå. The drillcores 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 as for virtual drill core mapping and will be a compliment 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 drillcore 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. The data have undergone Level 1 processing i.e. instrument and project specific system corrections has been applied. This includes

the implementation of wavelength calibrations if required, and the normalization of the data using the calibration files available. Data-poor bands have been removed from the dataset. Noisy data has been smoothed to minimize the effect of noise on further processing. A subset of bands has been selected from the original dataset in order to ensure that the data used for further processing and interpretation are not influenced by noisy data. The core has been isolated from the background core tray and other material; a box mask has been generated that removes the background from the image, retaining only the core box in the image. Also a core mask has been generated for the purpose of extracting the core itself from the core box.

Level 2 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 drillcores is fundamental basics 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, researches and students.

Data quality

Fundamental quality control steps are taken at this stage in order 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

Structure

Data from each drillcore is stored in a top level folder that is named with an unique ID that identifies the drillcore. This ID is similar to the IDCODE used in the SGU drillcore database, for example "BJT72222". Each drillcore folder further contains several subfolder and files. Directly under the top-folder there are three subfolders i.e. one folder for each of the sensors RGB, VNIR- SWIR and LWIR. Each of these three folders contains files from the individual corebox that make up the drillcore. The filenames are designated with a numeric suffix that increases downhole, e.g. "BJT72222_1" is the first corebox of the drillcore "BJT72222".

RGB

RGB contain three subfolders (named "RGB Box Mask", "RGB Extracted Image", "RGB Extracted Tray"):

- The "RGB Box Mask" folder contains TIFF images showing extracted corebox and metadata files in XML format.
- The "RGB Extracted Image" folder contains high resolution optical photos of the core. The image file is accompanied by a header file in ASCII format. It also contains metadata files in XML format.
- The "RGB Extracted Tray" folder contains metadata and two JPEG images of each corebox showing extracted drillcore from the corebox and a metadata file in XML format. One of the JPEGs includes a scalebar and information about the drillcore and corebox (id of the drillcore, meter interval, sensor type, SGU logo etc).

Example of level 2 files included in the “RGB Box Mask” folder of the RGB camera.

Filename	Format	Content
BJT72222_1_rgb_box_mask	TIFF	Imagefile showing extracted corebox
BJT72222_1_rgb_box_mask	XML	Metadata.

Example of level 2 files included in the “Extracted Image” folder of the RGB camera.

Filename	Format	Content
BJT72222_1_rgb_extracted_image	ASCII	Headerfile of image file with the same name.
BJT72222_1_rgb_extracted_image		ENVI compatible image containing corrected extracted reflectance data
BJT72222_1_rgb_extracted_image	XML	Metadata

Example of level 2 files included in the “RGB Extracted Tray” folder of the RGB camera.

Filename	Format	Content
BJT72222_1_rgb_extractedJPG	JPEG	True colour image, extracted
BJT72222_1_rgb_extractedJPG_ScaleLogo	JPEG	True colour image containing scale and some metadata, extracted
BJT72222_1_rgb_extractedJPG	XML	Metadata

VNIR-SWIR

VNIR-SWIR contains five subfolders (named “Box Depth Image”, “Box Extract”, “Core Mask”, “Extracted Image”, “False Colour Composite”):

- The “Box Depth Image” folder contains depth assigned images (ENVI compatible) and metadata files in XML format.
- The “Box Extract” folder contains TIFF images showing extracted corebox and metadata files in XML fomat.
- The “Core Mask” folder contains TIFF images showing extracted drillcore from the core box and metadata files in XML format.
- The “Extracted Image” folder contains the corrected extracted reflectance data as BIL files, compatible with other data viewing and querying software packages such as ENVI. The image file is accompanied by a header file in ASCII format. The folder also contains metadata files in XML format.
- The “False Colour Composite” folder contains two false color (FCC) images for each drillcore box generated from preselected bands to highlight variations in the core in the wavelengths of those bands. One image includes a scalebar and some information about the drillcorebox (id of the drillcore, meter interval, sensor type, SGU logo etc). The wavelengths used in the FCC images are: Red 1749 nm, Green 1649 nm, Blue 1419 nm. The folder also contains metadata files in XML format.

Example of level 2 files included in the “Box Depth Image” folder of the VNIR-SWIR camera.

Filename	Format	Content
BJT72222_1_box_depth_image	ASCII	Headerfile of BIL file with the same name.
BJT72222_1_box_depth_image	BIL	ENVI compatible depth assigned image

BJT72222_1_box_depth_image	XML	Metadata

Example of level 2 files included in the “Box Extract” folder of the VNIR-SWIR camera.

Filename	Format	Content
BJT72222_1_box_extract	TIFF	Imagefile showing extracted corebox
BJT72222_1_box_extract	XML	Metadata.

Example of level 2 files included in the “Core Mask” folder of the VNIR-SWIR camera.

Filename	Format	Content
BJT72222_1_core_masktiff	TIFF	Imagefile showing extracted drillcore
BJT72222_1_core_masktiff	XML	Metadata.

Example of level 2 files included in the “Extracted Image” folder of the VNIR-SWIR camera.

Filename	Format	Content
BJT72222_1_extracted_image	ASCII	Headerfile of BIL file with the same name.
BJT72222_1_extracted_image	BIL	ENVI compatible image containing corrected extracted reflectance data
BJT72222_1_extracted_image	XML	Metadata.

Example of level 2 files included in the “False Colour Composite” folder of the VNIR-SWIR camera.

Filename	Format	Content
BJT72222_1_FCC_extracted_image	JPEG	False colour composite (FCC) image
BJT72222_1_FCC_extracted_image_ScaleLogo	JPEG	False colour composite (FCC) image containing scale and some metadata
BJT72222_1_FCC_extracted_image_ScaleLogo	XML	Metadata

LWIR

LWIR contains four subfolders (named “Box Extract”, “Core Mask”, “Extracted Image”, “False Color Composite”):

- The “Box Extract” folder contains TIFF images showing extracted corebox and metadatafiles in XML format.
- The “Core Mask” folder contains TIFF images showing extracted drillcore from the core box and metadata files in XML format.
- The “Extracted Image” folder contains the corrected extracted reflectance data as BIL files, compatible with other data viewing and querying software packages such as ENVI. The image file is accompanied by a header file in ASCII format. The folder also contains metadata files in XML format.
- The ”False Colour Composite” folder contains two false color (FCC) images from each corebox generated from preselected bands to highlight variations in the core in the wavelengths of those bands. One image includes a scalebar and some meta information about the drillcorebox (id of the drillcore, meter interval, sensor type, SGU logo etc). The wavelengths used in the FCC images are: Red 8611nm, Green 10022 nm, Blue 11810nm. The folder also contains metadata files in XML format.

Example of level 2 files included in the “Box Extract” folder of the LWIR camera.

Filename	Format	Content
BJT72222_1_box_extract	TIFF	Imagefile, mask, showing extracted corebox
BJT72222_1_box_extract	XML	Metadata

Example of level 2 files included in the “Core Mask” folder of the LWIR camera.

Filename	Format	Content
BJT72222_1_core_masktiff	TIFF	Imagefile, mask, showing extracted drillcore
BJT72222_1_core_masktiff	XML	Metadata

Example of level 2 files included in the “Extracted Image” folder of the LWIR camera.

Filename	Format	Content
BJT72222_1_extracted_image	ASCII	Headerfile of BIL file with the same name.
BJT72222_1_extracted_image	BIL	ENVI compatible image containing corrected extracted reflectance data
BJT72222_1_extracted_image	XML	Metadata

Example of level 2 files included in the “False Colour Composite” folder of the LWIR camera.

Filename	Format	Content
BJT72222_1_FCC_extracted_image	JPEG	False colour composite (FCC) image
BJT72222_1_FCC_extracted_image_ScaleLogo	JPEG	False colour composite (FCC) image containing scale and some metadata
BJT72222_1_FCC_extracted_image	XML	Metadata