

## Metadata Asiaq topographic map NE Greenland

The Asiaq topographic map is made as an ArcGIS project at 1:100.000 scale. It includes the following features:

- Contours: 20m, distinguishing between land and glacier
- Contours: 100m, distinguishing between land and glacier
- Lakes
- Ice Caps
- Ice Shield
- Snow
- Rivers
- Streams
- Sea
- Coastline
- Place names
- DEM (digital elevation model)
- Hillshade
- Landsat 8 mosaic

The above feature classes are derived from different satellite products. In order to classify satellite imagery into features classes, we take advantage of pixel-based information, and a set of training data to carry out automated classification workflows. With such algorithms, the cost for map production can be significantly reduced, compared to completely manually-derived map products. Also, manual classification is subjective and therefore less consistent than automatic classification. The following steps are part of the automated workflows, which are described in further detail below: Data set-up for automatization and for training data, test, refinement, production roll out, validation.

### Data source

#### DEM

Input data was obtained from the ArcticDEM, release 5 v2.0. Strip DEM files correspond to the overlapping area of the input stereo-pair image swaths as they are collected by DigitalGlobe's constellation of polar-orbiting satellites. The mosaic DEM has a resolution of 8 m pixel size and is referenced to the WGS84 ellipsoid. The DEM data used was recorded from 2012 through 2015.

Not all input data strips from the ArcticDEM came with uniquely suggested xyz shifts, with respect to IceSAT. In order to improve absolute accuracy, Asiaq established a workflow for co-registration from the best quality DEM files from the area of interest.

The DEM was used to classify the following features:

- **River and Streams:** calculation of flow direction and flow accumulation: where more than 500 pixels accumulate the pixel is defined as "stream". Where four or more streams flow together, it is defined as "river". Calculations and vectorization is carried out in ArcGIS.

- **Contours:** Interval 20m and 100m, distinguishing between glacier and land contours
- **Hillshade:** Sun elevation angle 45, sun azimuth angle 315°

#### Landsat 8 mosaic

Landsat 8 data were collected from summer 2017, with minimum snow and cloud coverage. Atmospheric correction was done by the U.S. Geological Survey as an on-demand service. Their code makes use of the coastal aerosol band and auxiliary climate data derived from MODIS (MODerate Resolution Imaging Spectroradiometer).

The Landsat mosaic was used to classify following features:

- **Greenland Ice Sheet, ice caps and snow** with the help of a simple band ratio (Red / SWIR1 > 3). With the help of The Randolph Glacier Inventory, the classified data were divided into ice shield, ice caps, and snow.
- **Lakes:** Maximum likelihood classification, minimum lake size: 0.01 km<sup>2</sup>. GEUS G100V lakes were used for validation
- **Coastline:** Input of GEUS G100V, Landsat mosaic used as background, and coastline was manually updated

#### GEUS G100V:

- **Place names** are derived from the GEUS G100V map of NE Greenland.
- Input for **coastline and lakes** (training sets and validation)