

New airborne geophysical and remote sensing data from central East- and South-East Greenland

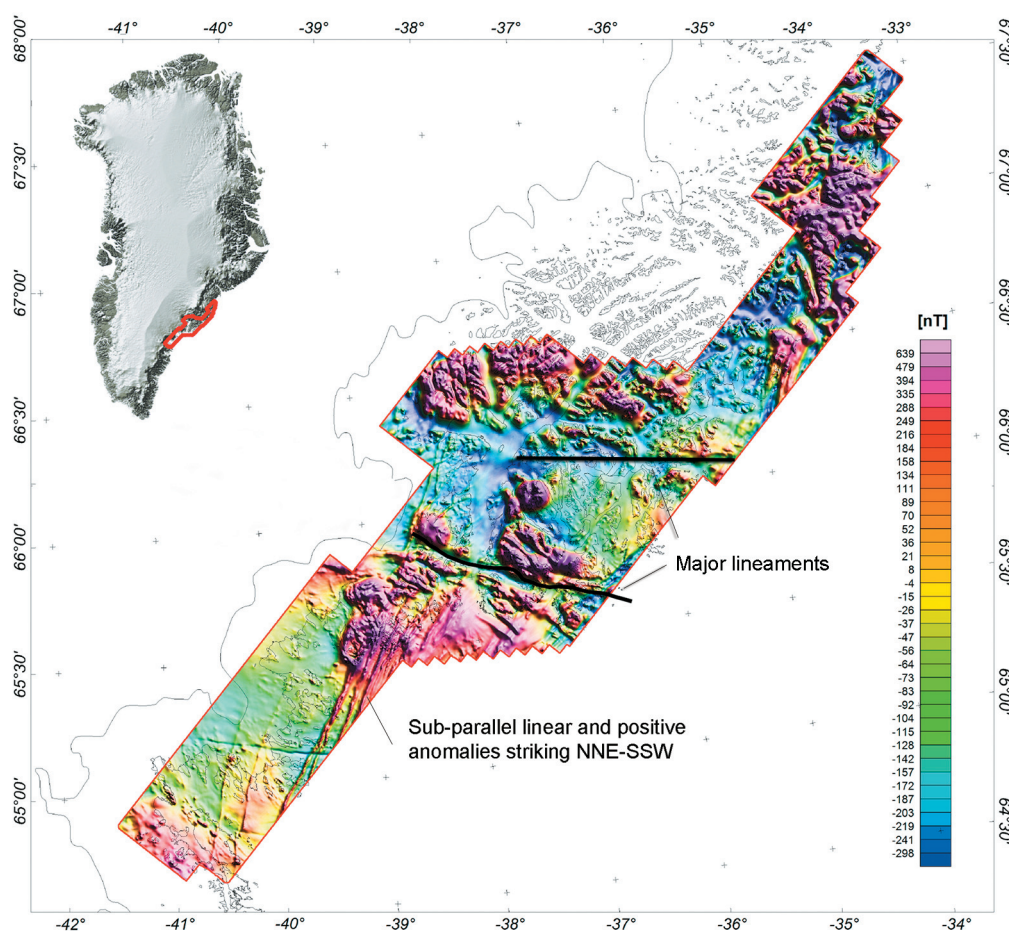
Geophysical and remote sensing data are central for the mineral exploration and geological mapping of Greenland. The geoscientific understanding has been improved through several geophysical and remote sensing surveys carried out over the last few years, adding new high-quality data to the already existing databases.

Regional airborne geophysical survey in South-East Greenland

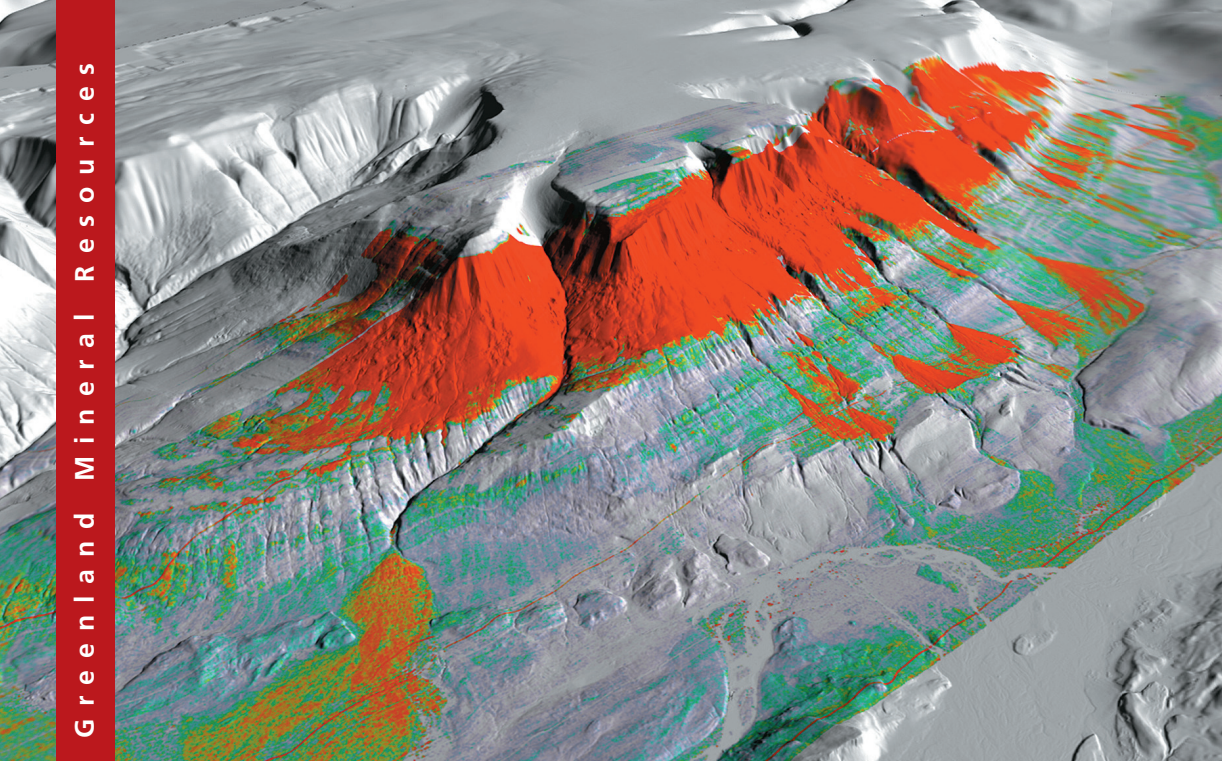
Geophysical surveys are nowadays used on a wide range of scales and for many purposes. In frontier and underexplored areas, where data are otherwise sparse or non-existent, aeromagnetic acquisition remains the cheapest and easiest way to obtain or refine an understanding of the structural setting. Through the government-financed *Aeromag* project, regional high-quality aeromagnetic datasets have been compiled through the last two decades. The *Aeromag* surveys are carried out using fixed-wing aircraft which fly along a gently draped surface above the ground and sea level with survey lines 500 metres apart. Including the most recent

Aeromag 2012 and 2013 surveys, a total of 633 500 line-kilometres of public data have been collected from 1992 to the present (see *Geology and Ore* no. 22). The private exploration industry has also produced significant surveys, usually at greater detail, over the same period.

The *Aeromag* 2013 survey, which was released in March 2014, covers coastal regions in South-East Greenland, stretching from north of Umiivik (64°45'N) and further northward to Kruuse Fjord (67°30'N). The 2013 survey has revealed a hitherto unknown sub-parallel swarm of Paleogene dykes offshore from the coastal areas, only observed outcropping on a few islands along the coast. In addition, the Palaeoproterozoic intrusions of the Ammassalik Igneous Complex are clearly discernible as well as several major structural lineaments coinciding with possible suture zones or terrain boundaries. Many more local and significant anomalies can be identified in the *Aeromag* 2013 dataset; interpretations and further analyses are underway in several areas. For more information on the 2013 survey see Riisager & Rasmussen 2014.



Aeromagnetic anomaly map of the survey area in South-East Greenland covered during the *Aeromag* 2013 project.



Extensive kaolinisation (red colours) at Klitdal, central East Greenland mapped through hyperspectral survey data, draped on the high resolution LiDAR digital elevation data. Copyright GEUS.

Remote sensing survey in central East Greenland

Airborne remote sensing provides an efficient method for the rapid collection of data to assist geological mapping and mineral exploration. Depending on the spatial and spectral resolution, hyperspectral surveys offer mapping opportunities on both reconnaissance and detailed scales.

Airborne imaging spectrometer data were acquired for the first time over Greenland during the *Hyperspectral 2000-2002* project, focusing on mapping of kimberlites and mineral occurrences associated with hydrothermal alteration.

In the summer of 2012 the most recent hyperspectral survey (*HyperEast 2012*) was flown by The NERC Airborne Research & Survey Facility in central East Greenland using a Dornier 228-101 research aircraft equipped with both Specim AISA Eagle and Hawk sensors, a Leica ALS50-II LiDAR and a Leica RCD105 39 mega-pixel camera. The *HyperEast 2012* hyperspectral data have a 2 metre spatial resolution and covers 486 spectral bands from 400 up to 2500 nm. As shown in the figure above the combined interpretation of hyperspectral,

LiDAR, and digital photography data opens exiting new perspectives for the use of airborne survey data on the well-exposed geology of Greenland, in relation to both hydrocarbons and mineral occurrences. For more information on the *HyperEast 2012* dataset see Thorning *et al.* 2014.

The entire database of government-financed geophysical and remote sensing data from Greenland can be inspected online at Greenland Mineral Resources portal (<http://www.greenmin.gl>).

Key references

- Rasmussen, T.M., Thorning, L., Riisager, P. & Tukiainen, T. 2013:** Airborne geophysical data from Greenland, *Geology and Ore* no. **22**, 12 pp.
- Riisager, P. & Rasmussen, T.M. 2014:** Aeromagnetic survey in south-eastern Greenland: project Aeromag 2013, *Geological Survey of Denmark and Greenland Bulletin* **31**, 63-66 pp.
- Thorning, L., Christensen, N.N., Olsen, S.D., Riisager, P., Sørensen, L.L., Sørensen, E.V. & Tukiainen, T. 2014:** High resolution airborne hyperspectral spectroscopy in Central East Greenland 2012 – Data acquisition and pre-processing. *Danmarks og Grønlands Geologiske Undersøgelse Rapport 2014/7*, 35 pp.



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