



# Landsat image database for Greenland

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As a consequence of the GIRS project (Geological Information from Remote Sensing; Tukiainen & Thorning, this report) a database of Landsat images for Greenland suited for geological interpretation has been established at the Geological Survey of Greenland (GGU) with the help of funds from the Mineral Resources Administration for Greenland. This note briefly introduces the new GGU facility. This database has been established in order to make satellite images more readily available for all potential users of Landsat data in Greenland at standard conditions and price.

The first generation of Landsat satellites commenced with the launching of Landsat 1 in 1972; its successors Landsat 2 and 3 were launched in 1975 and 1978, respectively. These early Landsat satellites were equipped with a four channel multi-spectral scanner (MSS) covering the spectral range from 0.5  $\mu\text{m}$  to 1.1  $\mu\text{m}$ . The ground pixel resolution is 80 by 80 metres.

The launching of Landsat 4 in 1982 followed by Landsat 5 in 1984 started a new era in the use of remote sensing for the earth sciences. This was due to the new 7-channel imaging system: the Thematic Mapper (TM) provided



Fig. 1. Index map showing the coverage of the Landsat TM data in the GGU satellite image database. The data stems from the satellite Landsat 5. The ground pixel resolution is  $30 \times 30$  metres in the six bands of the visible and infrared, and of  $120 \times 120$  metres in the thermal infrared channel.

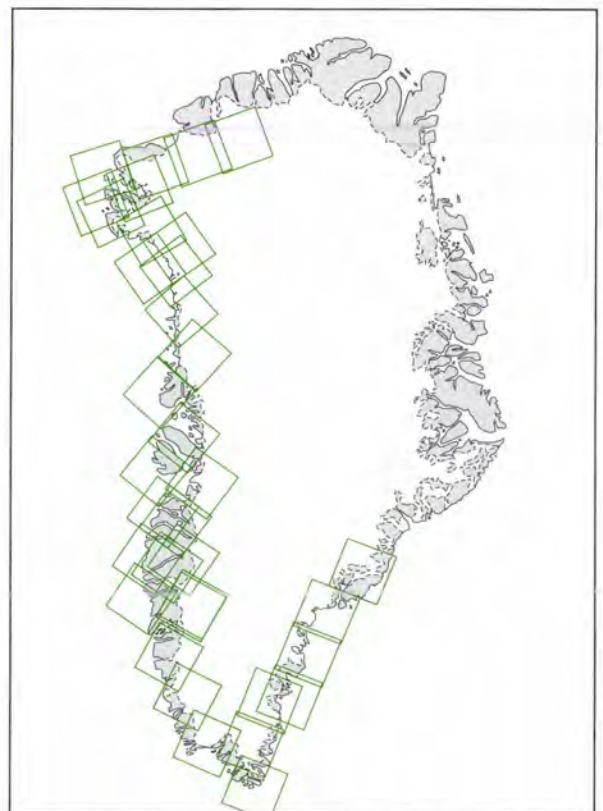


Fig. 2. Index map showing the coverage of the historical Landsat MSS data in the GGU satellite image database. The data stems from the satellites Landsat 3 and 4. The ground pixel resolution is  $80 \times 80$  metres.

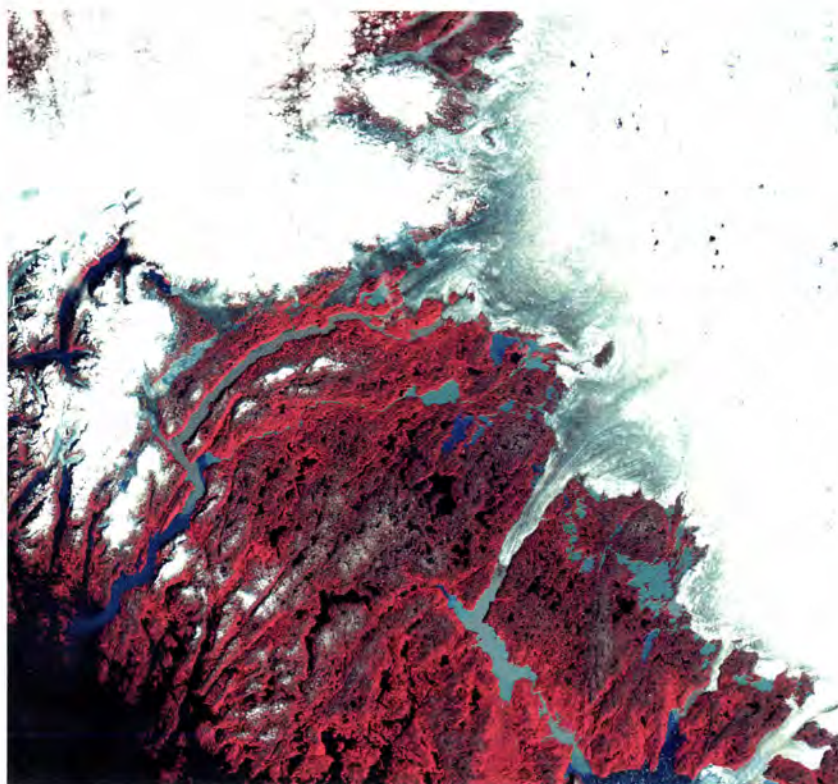


Fig. 3. Typical preview of a Landsat TM scene, path 007, row 014 covering the area highlighted in Fig. 1.

higher spectral and spatial resolution. The TM-sensor covers the spectral range from 0.45  $\mu\text{m}$  to 2.35  $\mu\text{m}$  with a ground pixel resolution of 30 by 30 metres.

The Landsat TM data are being used worldwide as a standard tool for environmental control, forestry, agriculture and mapping of natural resources. The system is especially suited for geological mapping and detection of various types of hydrothermal alteration which can indicate mineral deposits.

### Search for existing Landsat scenes

Some 8000 Landsat TM previews covering most of the ice-free areas in Greenland have been evaluated by the authors at Satellitbild (Swedish Space Corporation) in Kiruna, Sweden. Satellitbild also provided contact with American and Canadian databases, and through these sources further coverage was obtained over parts of West Greenland. As a whole approximately 650 images of very good to acceptable quality were found; 46 of these scenes suited for geological work were selected for delivery to GGU. Figure 1 shows the coverage of the selected images. In addition 34 earlier Landsat 3 and 4 images covering most of Greenland were selected (Fig. 2).

### Acquisition of new images

The contract with Satellitbild further included registration of new images from areas without data. However, this was made difficult by the failure of the new Landsat 6 satellite, and by the fact that Landsat 4 could no longer be programmed. The acquisition of new images had therefore to be based on Landsat 5 which had the drawback that the data could only be retrieved from areas which were within the range of a tracking station for direct recording. Despite several attempts over the summer of 1994, cloud cover and generally unfavourable conditions made it impossible to obtain any scenes of the primary target areas before snow again covered all exposures; a few scenes of improved quality were obtained from areas already covered.

### Landsat data on CD-ROM

The selected images were delivered to GGU on CD-ROMs during the autumn of 1994. The 46 Landsat TM images are on one CD-ROM each whereas the 34 MSS-images are on three CD-ROMs. The radiometric and geometric corrections for systematic distortions (scan skew, cross track distortion) have been applied to the data. The

CD-ROMs delivered to GGU are available for in-house use at GGU or in scientific cooperation with GGU, and they can be inspected at GGU by potential purchasers prior to placing orders. GGU will accept orders, and forward them to Satellitbild for normal delivery.

### **New Landsat image previews from Greenland**

In order to assist with the selection of Landsat images digital previews of all images shown in Figs 1 and 2 have been produced on two CD-ROMs by GGU with the help of Satellitbild, one with the previews of the 46 Landsat TM images and one with the 34 Landsat MSS images. These previews are subsampled scenes of the bands 4, 3, 2 and 3,

2, 1 for Landsat TM and Landsat MSS, respectively. The scenes were processed to give a 'natural look' and they are available as portable bitmaps (BMP format). They can therefore be viewed using a number of standard PC programmes. One preview scene can be stored on a normal 1.44MB diskette, and an example is shown in Fig. 3. These CD-ROMs and diskettes are on sale from GGU or from Satellitbild.

*Acknowledgements.* The authors wish to express their appreciation of the assistance given by Satellitbild and Esrange tracking station, Kiruna, during their stays there and for the production of the CD-ROMs.

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