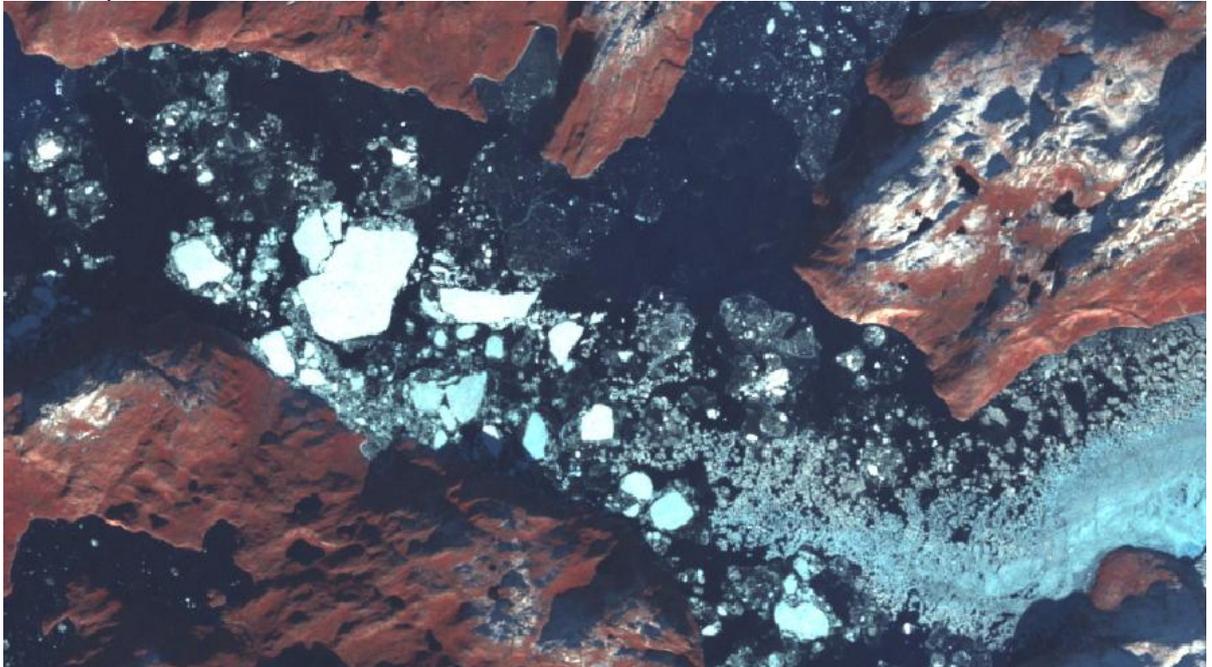


Snow and Ice Cover Mapping

- baselines and up-to-date information



Introduction

The use of satellite images provides an ideal approach for mapping the changes in environmental parameters. With satellite images it is possible to go up to 40 years back in time and map large areas with respect to sea ice, glacier margins, lake ice and snow cover and to map the degree of annual and inter-annual variations in these parameters.

This information is crucial if you want to know how many days per year you can navigate to the bottom of a specific fiord or bay - or if you want to assess the risk of ice damage to infrastructure or installations. This can be analysed based on historic data in a spatial resolution from 30 m (weekly/monthly time scale) to 250 m resolution for daily monitoring. Images as detailed as 50 cm resolution can be obtained from satellites from any location in the world on demand.

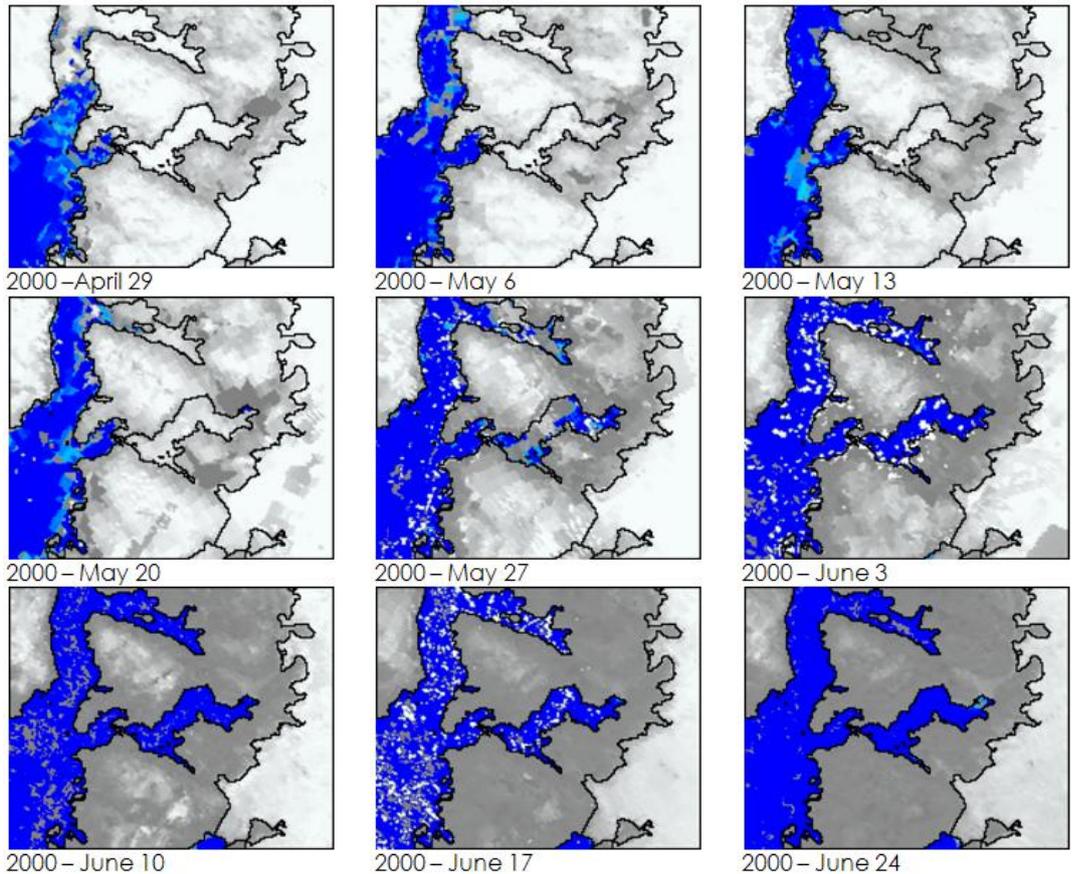
Optical remote sensing is a very cost effective way of obtaining this type of information. In some cases, eg. in low light conditions during the winter or in cloudy situa-

tions it is an advantage to use radar imagery, since radar remote sensing can penetrate cloud cover and image through darkness.

The image above is from Western Greenland and has a spatial resolution of 30 m. Icebergs are clearly visible in the fiord. Detailed analyses such as average conditions and optimal navigation routes can be prepared in a GIS and visualized as maps or as Google overlays.

Key benefits

- Low cost data source
- Map seasonal and inter-annual variations
- Access sea ice information in remote regions
- Information on seasonal variations important for navigation and planning
- Ready to be used in GIS or as a standalone output



Dynamic mapping

In the illustration above sea ice variations in a Greenland fjord have been mapped based on 250 m resolution satellite images over a period of ten years. The example shows the ice melt season in 2000. Blue colors indicate water, while different densities of ice/snow are in white/grey tones. Ice breakup for this location is late May while completely ice free conditions occur in end June. This type of analysis can identify minimum, maximum and average ice cover in the fiord. The results are also presented as graphs and tables.

Operational solutions

GRAS has profound experience in operational monitoring of marine parameters such as sea surface temperature, sediment and algae blooms. This technology can also be used for operational near real time sea

ice or snow cover information. GRAS can deliver daily data from anywhere in the world in a spatial resolution starting from 250 m. From our dedicated processing systems the data can be delivered in near real time in a GIS ready format or as traditional TIFF imagery. The output can also be in the form of maps in standard format (e.g. PDF).

About GRAS

Since 2000, GRAS has successfully completed more than 150 projects in more than 45 countries. We collaborate closely with leading experts at the Department of Geography & Geology and DHI. GRAS is owned by DHI, an independent consulting and research organisation specialised in water and environment. DHI has around 1000 staff in more than 25 countries.

GRAS – Geographic Resource Analysis & Science A/S

Email: gras@grasdk.com
 Website: www.grasdk.com
 Phone: +45 35 32 41 75

Øster Voldgade 10
 1350 Copenhagen K
 Denmark