# Monitor snow cover

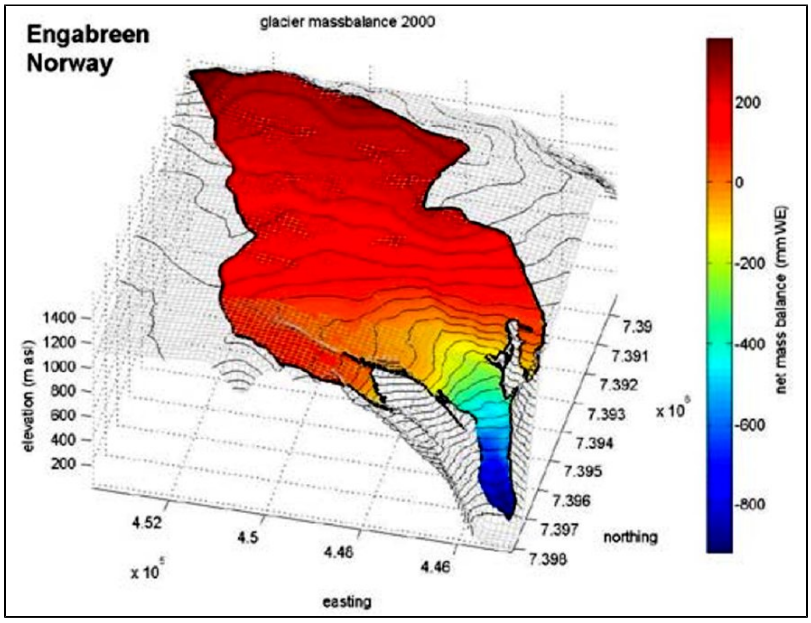
## Applications

### Snow and Glacier Monitoring

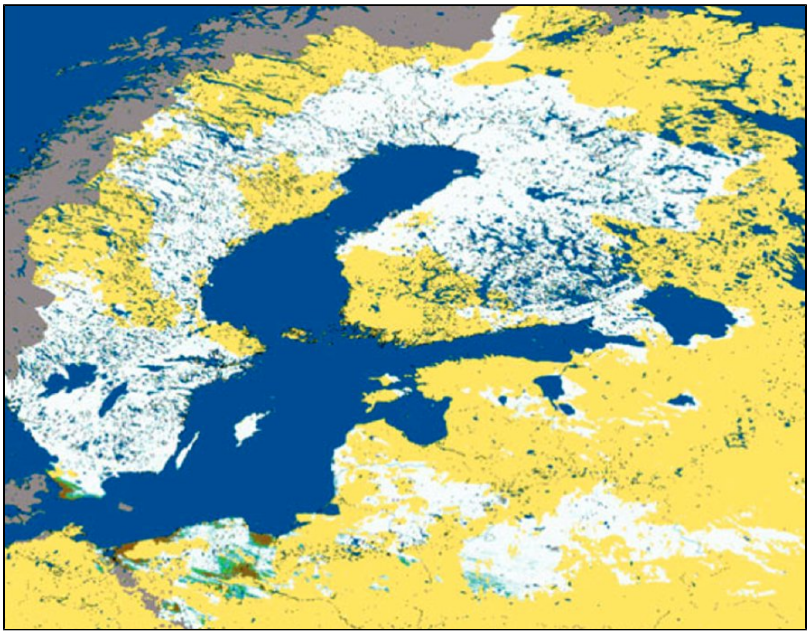
Satellites can map the snow-covered areas and provide baseline glacier outlines, changes to surface area, velocities and mass balance. The service provides information concerning freshwater run-off from snow covered areas and glaciers relevant as important contributions to hydroelectric capacity within a hydropower project. Obtaining run-off estimates from these sources is important both during the project development phase and as part of the hydropower day-to-day operations planning.

Satellite based snow covered area products can reliably be provided down to a spatial resolution 500 meters. Global coverage is possible and updates can be provided on a weekly basis. In addition, historical data sets can be made available for the last 30 years to assess how the evolution of snow conditions in the watershed. Glacier information can be provided at sub-meter resolution to the scale of hundreds of meters, depending on the glacier size and the accuracies required for run-off model input. Annual updates will often be sufficient to follow glacier evolution.

Both the snow and the glacier products can be provided with a geometric accuracy of less than a pixel. It has been demonstrated that having both satellite snow and glacier information can
improve catchment run-off modelling and even reduce in-situ observations without significant impact in model output accuracy.




Snow Monitoring Baltic Region during melting period. Credits: Syke



Glacier mass balance of Engabreen, Svartisen, modeled using an energy-balance model validated with EO data. Credits: Regine Hock/Thomas Schuler.

As demand grows for clean, reliable, and affordable energy, the role of hydropower has increased over the past decade as developing nations move to harness their resources.

Hydropower reservoirs are often built for multiple purposes, such as irrigation and drought protection that drives poverty alleviation and sustainable development. Currently, the World

Bank Group is engaged in hydropower projects in all its regions. The activities include both construction of new projects and rehabilitation of old projects. Earth observation services can play a vital role in all phases of a hydropower project, from estimating the environmental impact on ecosystems to providing potential water run-off from snow and glaciers. Glaciers can also represent an important run-off potential for hydropower reservoirs. A number of countries are highly dependent upon its glaciers and glacial runoff for energy production, for example in the Andes region, hydropower supplies 81% of Peru's electricity

The Sentinel 1, 2 and 3 satellites will both provide continuity with respect to monitoring of snow covered area and glaciers.

**References:**

ESA 2013, Earth Observation for Green Growth: An overview of European and Canadian Industrial Capability

# Products

| Products | Source | Descriptions | Product Standards | Ref. Project |
|---|---|---|---|---|
| snow products | cryoland source | • Binary Snow Cover Area<br>• Fractional Snow Cover Area<br>• Statistical Snow Cover Information<br>• Snow Water Equivalent<br>• Snow Surface Temperature<br>• Map of Melting Snow<br>• Snow Surface Wetness<br>• Snow Grain Size<br>• Spectral Albedo Maps | | Cryoland |

# Success Stories

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# References

| Topic | Description | Key words | References |
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