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Sodankylä National Satellite Data Centre

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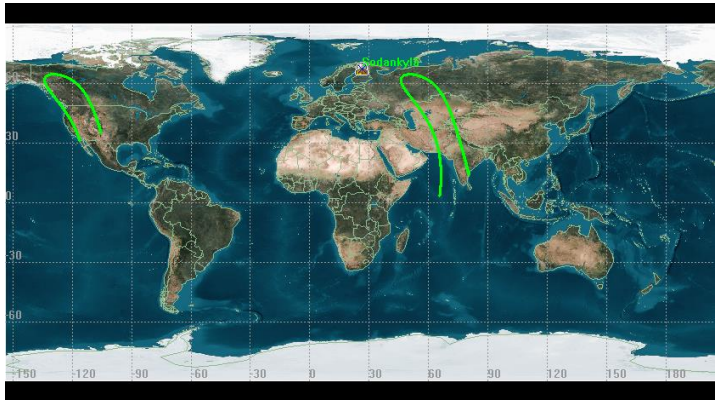
Sodankylä National Satellite Data Centre

National satellite data center providing satellite data reception and data processing services to Finnish and international partners

Satellite visibility from Sodankylä

- **Sodankylä location is nearly optimal**
  - 67°22’04.2’’ N (67.3678° N)
  - 26°37’57.6’’ E (26.6327° E)
- **10/14 polar spacecraft orbits visible**
- **Excellent visibility to Molniya (i=63,4°) orbit**
- **Stable weather conditions**
- **Full sky visibility.**



Satellite data availability from FMI Arctic Research

Current operational (free access)

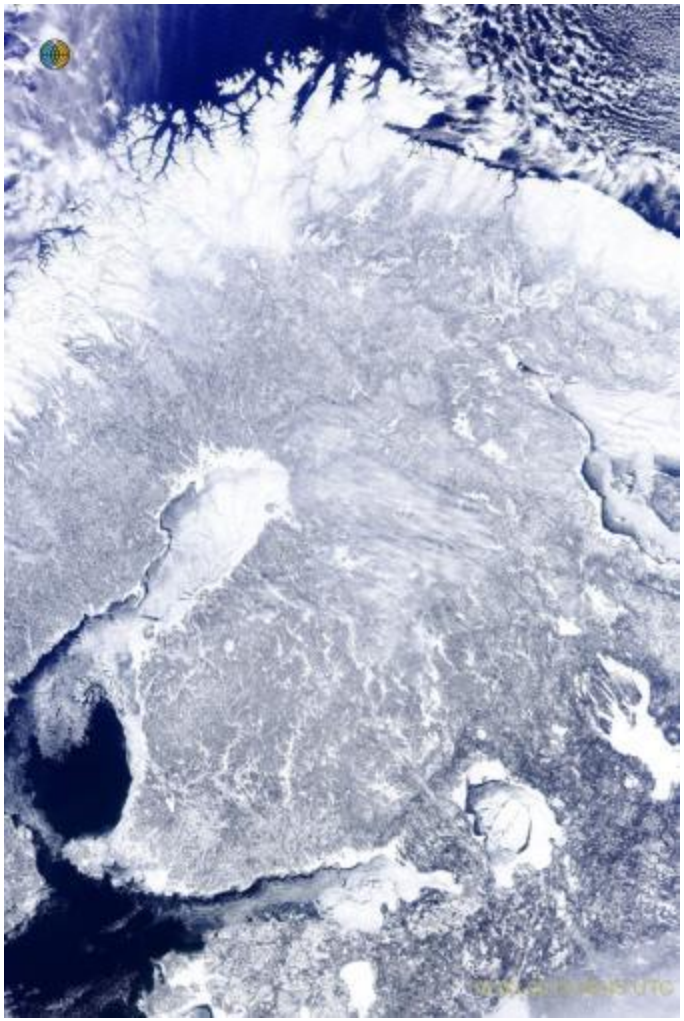
- EOS-Terra/MODIS
- EOS-Aura/ OMI
- Suomi-NPP/VIIRS & OMPS
- ~~FY-3A/MERSI~~

Current operational (commercial)

- COSMO-SkyMed (SAR)

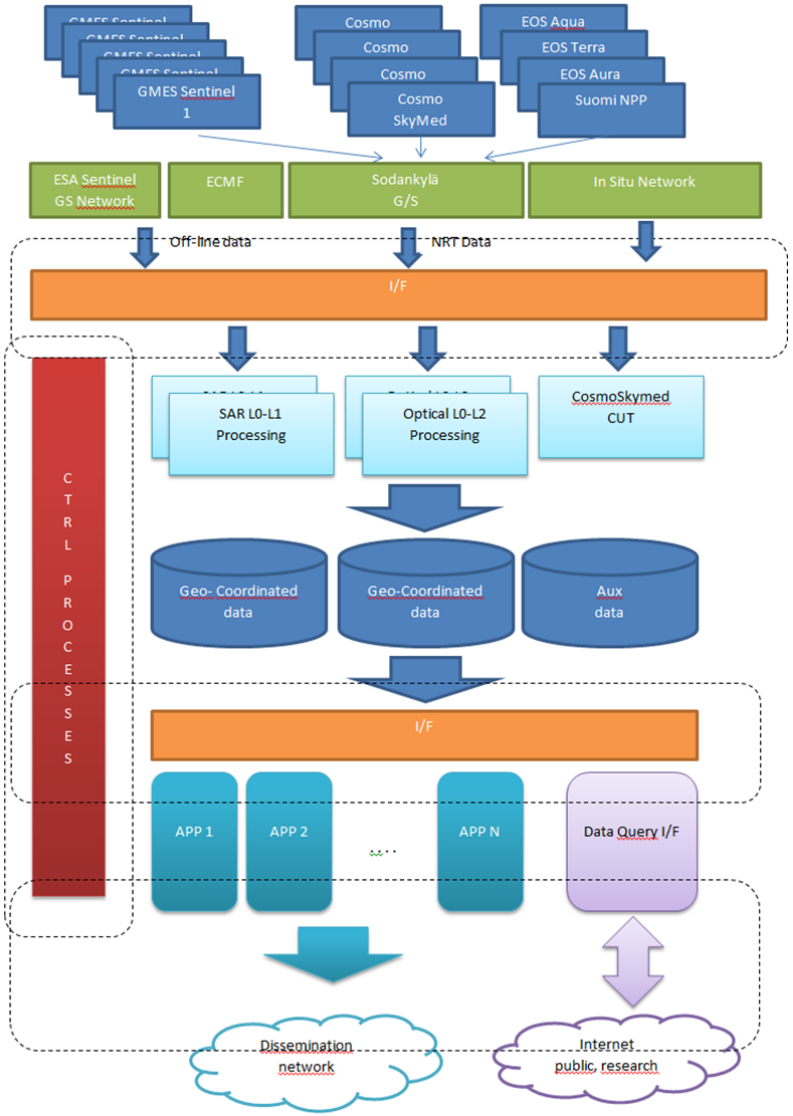
Future

- FY-3C & FY-3B / MERSI
- **Sentinel-1 Collaborative GS:** NRT delivery from local reception
- **Sentinel-1/2/3 Collaborative GS :** National Mirror Site



Processing Lines

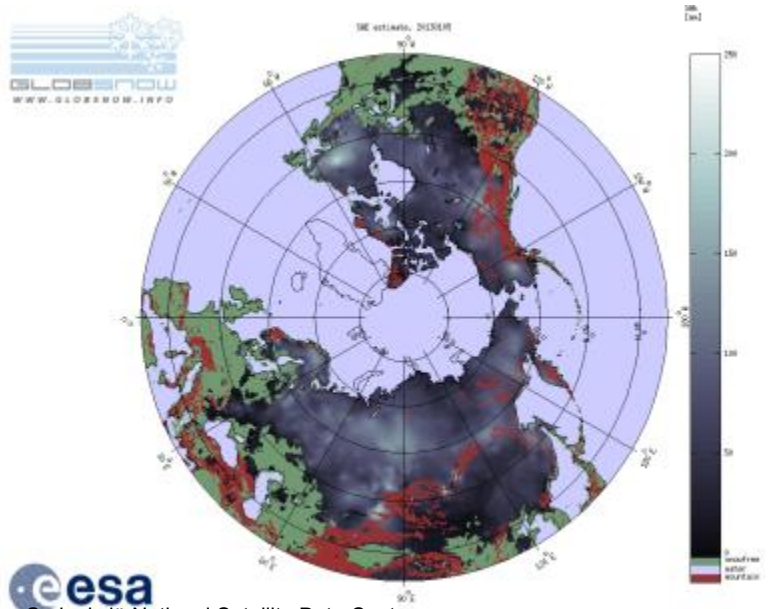
- **Streamlined processing chains for data production**
- **Virtualization provides flexibility and scalability**
- **Cluster processing system (32 cores) for high performance computing**
- **Current archiving capacity >300TB**
- **Possibility to host both**
  - External servers
  - External processing lines
  - Processing in virtual environment



ESA-GlobSnow – Operational Snow processing of Northern Hemisphere

Snow Water Equivalent (SWE)

- 30 year-long CDR time-series on snow conditions of Northern Hemisphere (25 km grid)
- Passive microwave radiometer data combined with ground-based synoptic snow observations

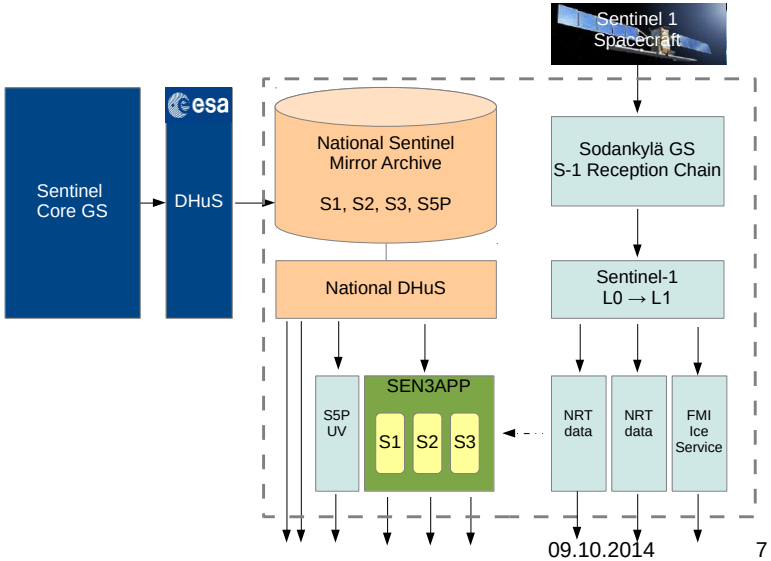


Snow Extent (FSC)

- 15 years Snow Extent data record from ESA ATSR-2 (1995-) and AATSR (2002-) on a hemispherical scale.
- Methodology developed especially for forested regions
- Operational data production at FMI
- **Sentinel 3 SLSTR** needed for continuation

Copernicus Collaborative Ground Station

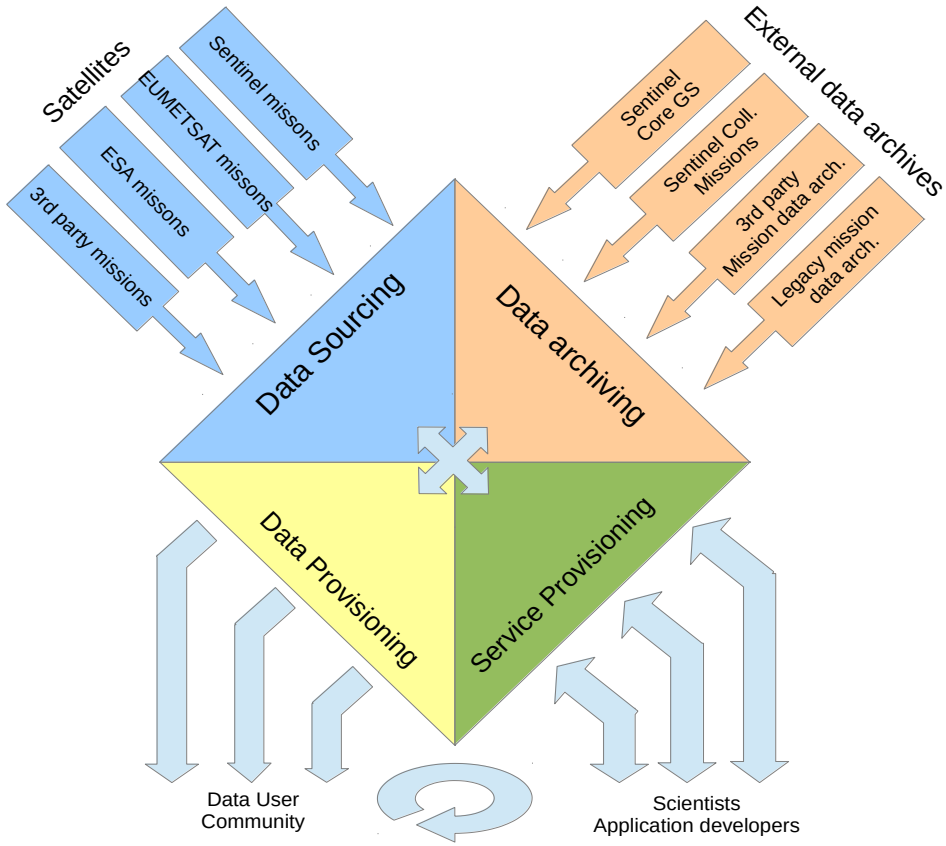
1. **Local reception of Sentinel-1 Direct Broadcast**
   - Focus on NRT and Quasi-Real-Time products
   - Special Interests:
     - S1 -> Baltic Sea Ice monitoring, Oil spill monitoring
2. **National Sentinel mirror site**
   - Provision of Sentinel data to Finnish and international data users
     - S1, S2, S3, S5P
   - Long-term data archive
   - Automated data processing lines for specific products
   - Hosting of processing services



Baltic regional and Cryospheric Thematic Exploitation Platform

Planned

- **Satellite data has traditionally been processed in monolithic processing centers**
- **This paradigm is changing towards distributed centers**
- **Thematic Exploitation Platform provides**
  - Fast access to data concerning certain themes, including satellite data, in-situ data
  - Processing capacity (cloud, grid, clusters) / IaaS
  - Processing software (toolboxes, commercial sw) / PaaS
  - General platform functionality (user management, access control, accounting, security, portals)



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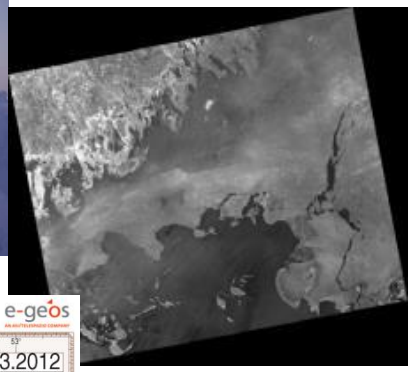
Products and Services

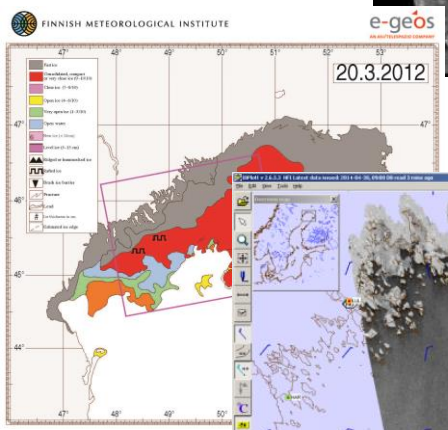
Baltic Sea Ice Charting and Oil spill monitoring

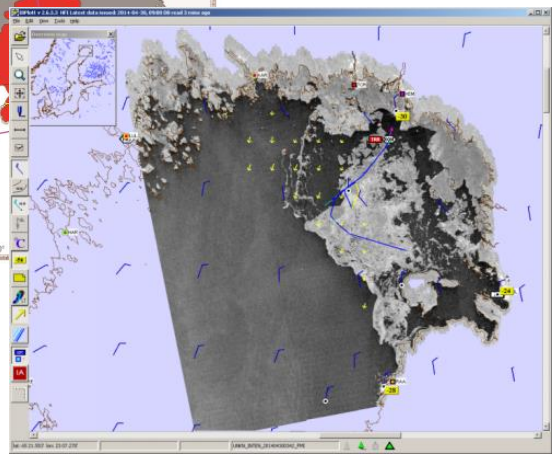
- **Commercial and environmental needs**
  - Finland is essentially an island
  - ~90% of Finland's import and export via sea routes
  - Gulf of Finland is one of the most busiest marine routes for oil transport
- **SAR for sea ice charting**
  - Currently RSAT2 and CSK images used. S1 welcomed addition in 2015
  - Daily products for ice breakers and ships
- **SAR for oil spill monitoring**

SAR images for ice breakers guidance

- **Radarsat-2, COSMO-SkyMed, Sentinel-1 SAR data used**
- **Automated processing chain**
  - CSK acquisition programming at Sodankylä
  - Data reception from CSK spacecraft
  - Automated processing of SAR image
  - Ice conditions analysis at FMI Ice Service
  - Data push to FIN-SWE Ice breaker fleet
- **Image delivery to ice breakers Near real time**
  - In optimal timing <30 min from image acquisition
- **Fully operational in Baltic sea ice season 2014-2015**

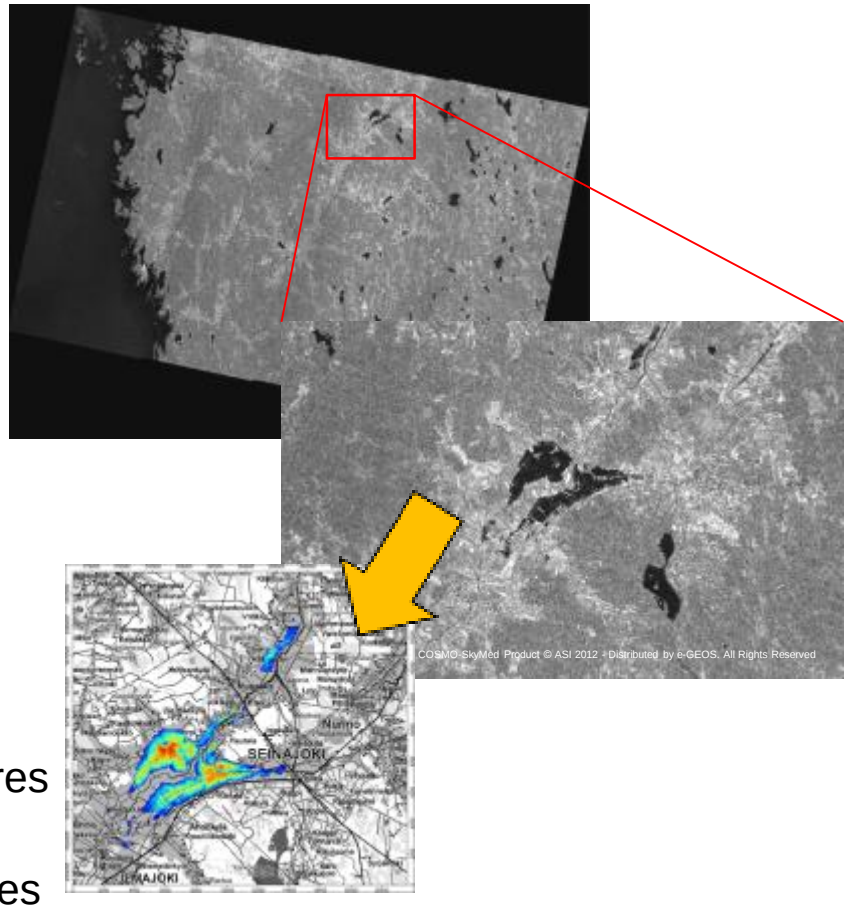






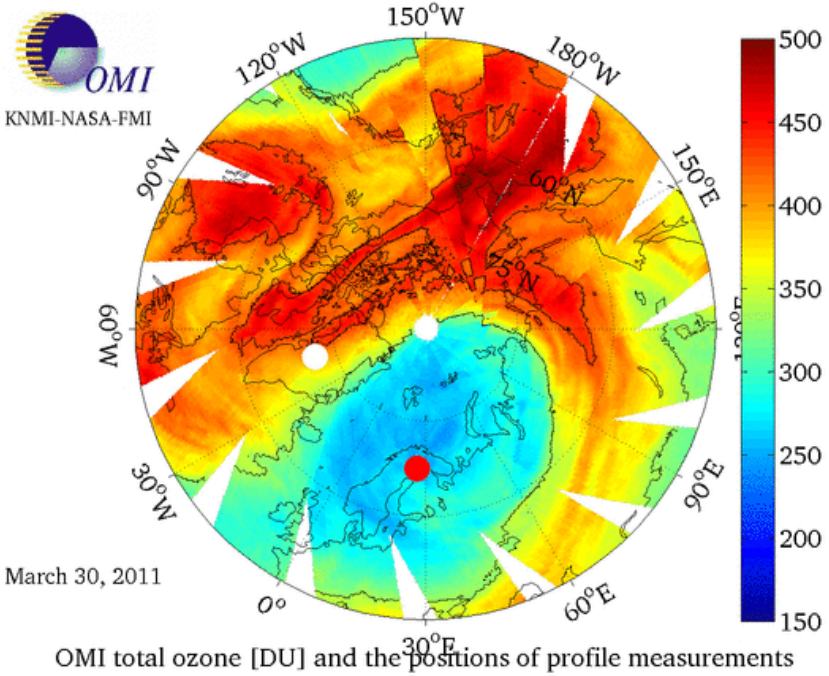
Flood extent products

- **COSMO-SkyMed (SAR)**
  - Constellation of 4 spacecraft
  - Active microwave (X-band) instrument - Uses signal doppler effect to improve resolution
  - Insensitive to illumination conditions
    - Works day and night
  - Insensitive to weather
    - Works in rain
    - Works in cloudy weather
- **Process**
  - Identification of water bodies
  - Removal of known lakes (Corine)
  - Flood depth estimation by utilising high-res DEM
  - Generation of map products for authorities and public



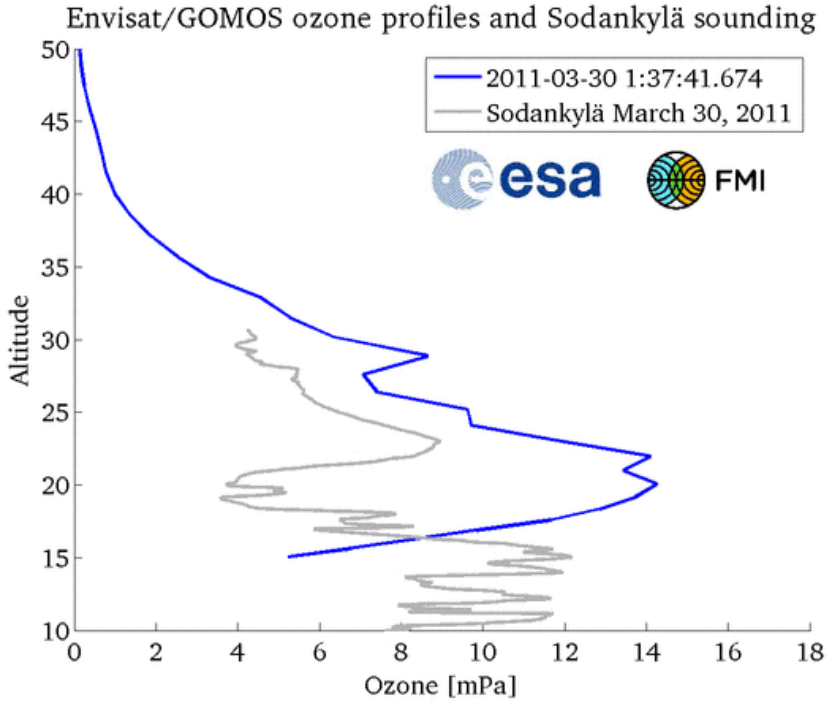
Atmospheric Ozone and UV-radiation

OMI total ozone



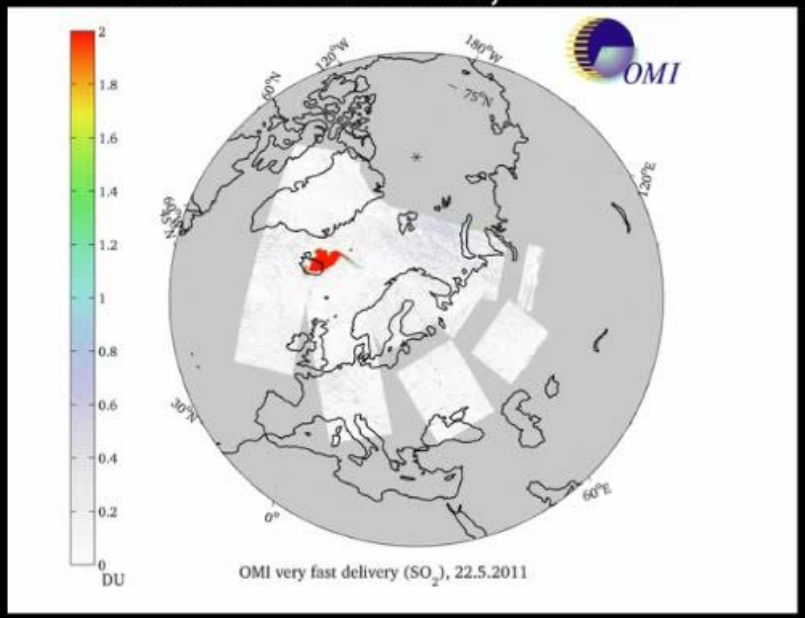
OMI total ozone [DU] and the positions of profile measurements

GOMOS ozone profiles Sodankylä sounding



Volcanic ash monitoring from satellite imagery
Grimsvötn eruption 21.5 2011

Lähde: Iltalehden verkkosivut

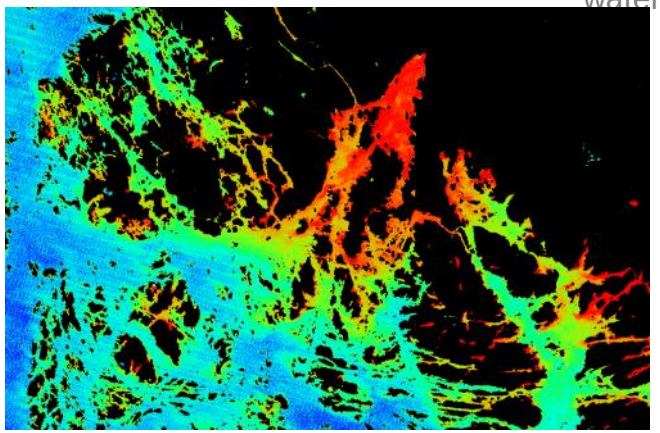


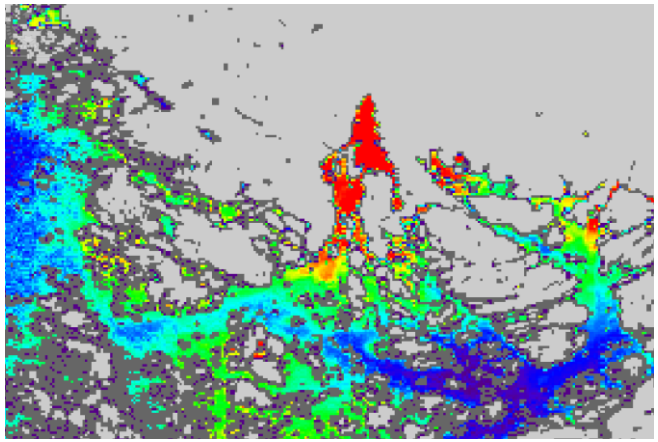
NASA / KNMI / FMI

Water quality services by SYKE using Sentinels

- Specific features in nordic areas
  - Cloud coverage
  - Specific optical properties in nordic waters (coloured dissolved organic matter in water)
    - Standard Level 2 products not OK, Local tailoring needed
- High resolution data needed from
  - Sentinel 3
  - Sentinel 2 needed for archipelago and lakes
- EWFS services have suffered from long data gaps 2009-2011, preventing NRT production several times during the peak algae bloom season → backup is needed!
- Why NRT?
  - SST: Detect upwelling
  - Chl-a, Algae blooms: For weekly Algae reports
  - For rapid planning of Aranda and Muikku research vessels
  - For turbidity, detect resuspension

Landsat 5 TM, 2 June 2007 Turbidity
Relative scale: red = very turbid, blue = clear water





MERIS TSM 3 June 2007
Relative scale: red = very turbid, blue = clear water

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