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METEOROLOGISKA INSTITUTET  
FINNISH METEOROLOGICAL INSTITUTE

# Sodankylä National Satellite Data Centre

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services R&D**





# Sodankylä National Satellite Data Centre

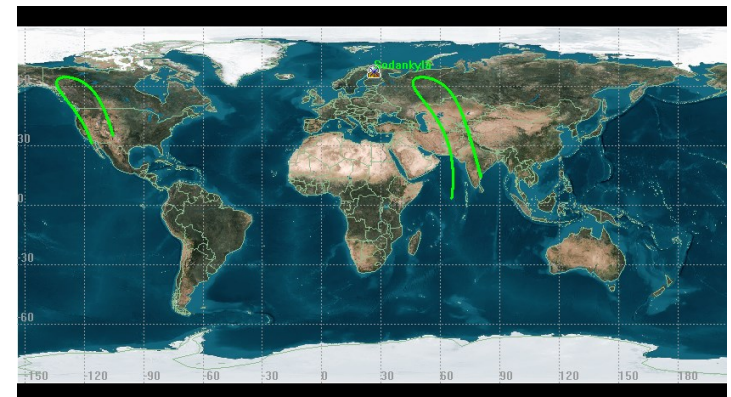
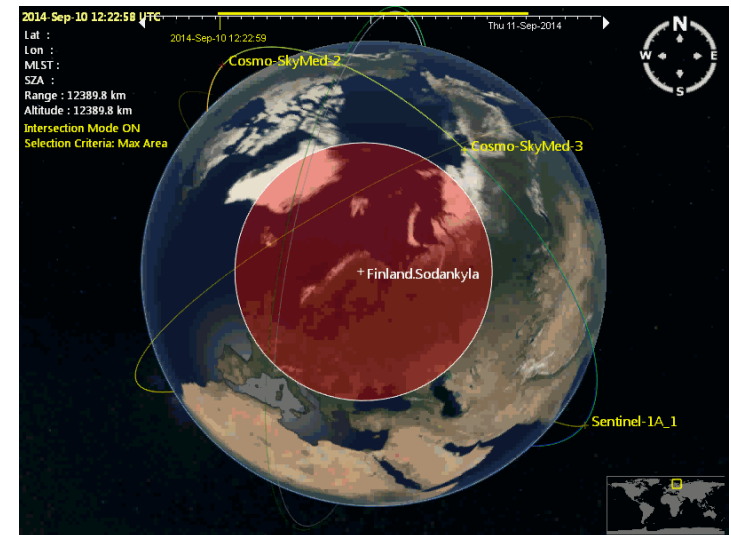


**National satellite data center providing satellite data reception and data processing services to Finnish and international partners**



# Satellite visibility from Sodankylä

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





# Satellite data availability from FMI Arctic Research

## Current operational (free access)

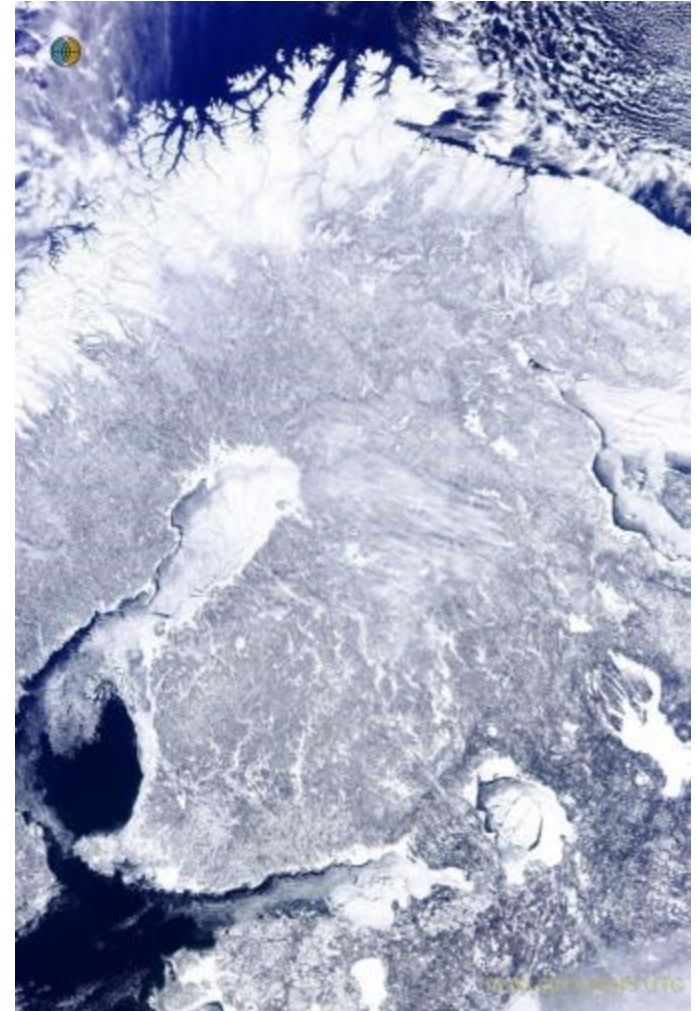
- EOS-Terra/MODIS
- EOS-Aura/ OMI
- Suomi-NPP/VIIRS & OMPS

## 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

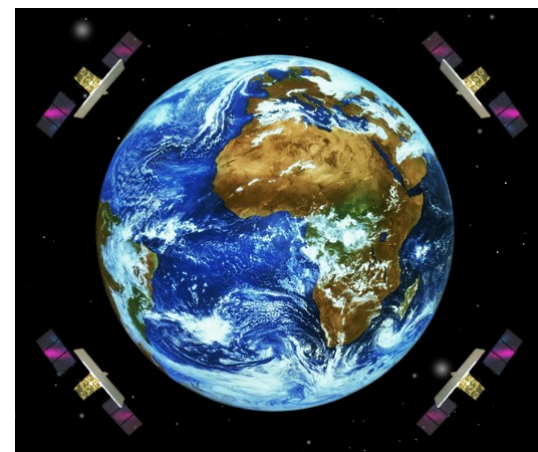






## Cosmo Sky-Med (CSK)

- Tasking and data reception in Sodankylä – Easier access to images.
- X-band – day and night capability, weather insensitive
- 4 satellites, short revisit time, many imaging options
- 5 possible imaging modes



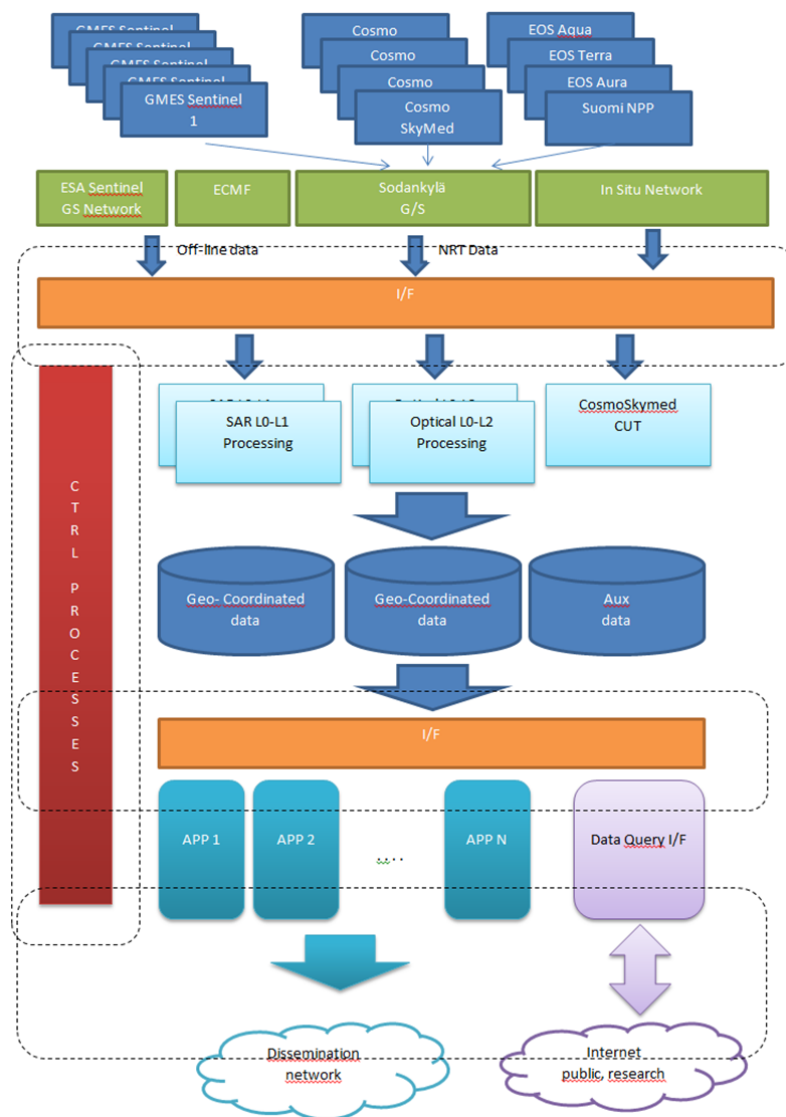
Product	Area Size	Resolution	Polarization
ScanSAR Huge	200 x 200 km	100 m	VV / HH
ScanSAR Wide	100 x 100 km	30 m	VV / HH
Stripmap HIMAGE	40 x 40 km	3-5 m	VV / HH
Stripmap PingPong	30x30 km	15 m	HH / VV / VH / HV
Spotlight 2	10x10 km	1 m	VV / HH





# Processing Lines

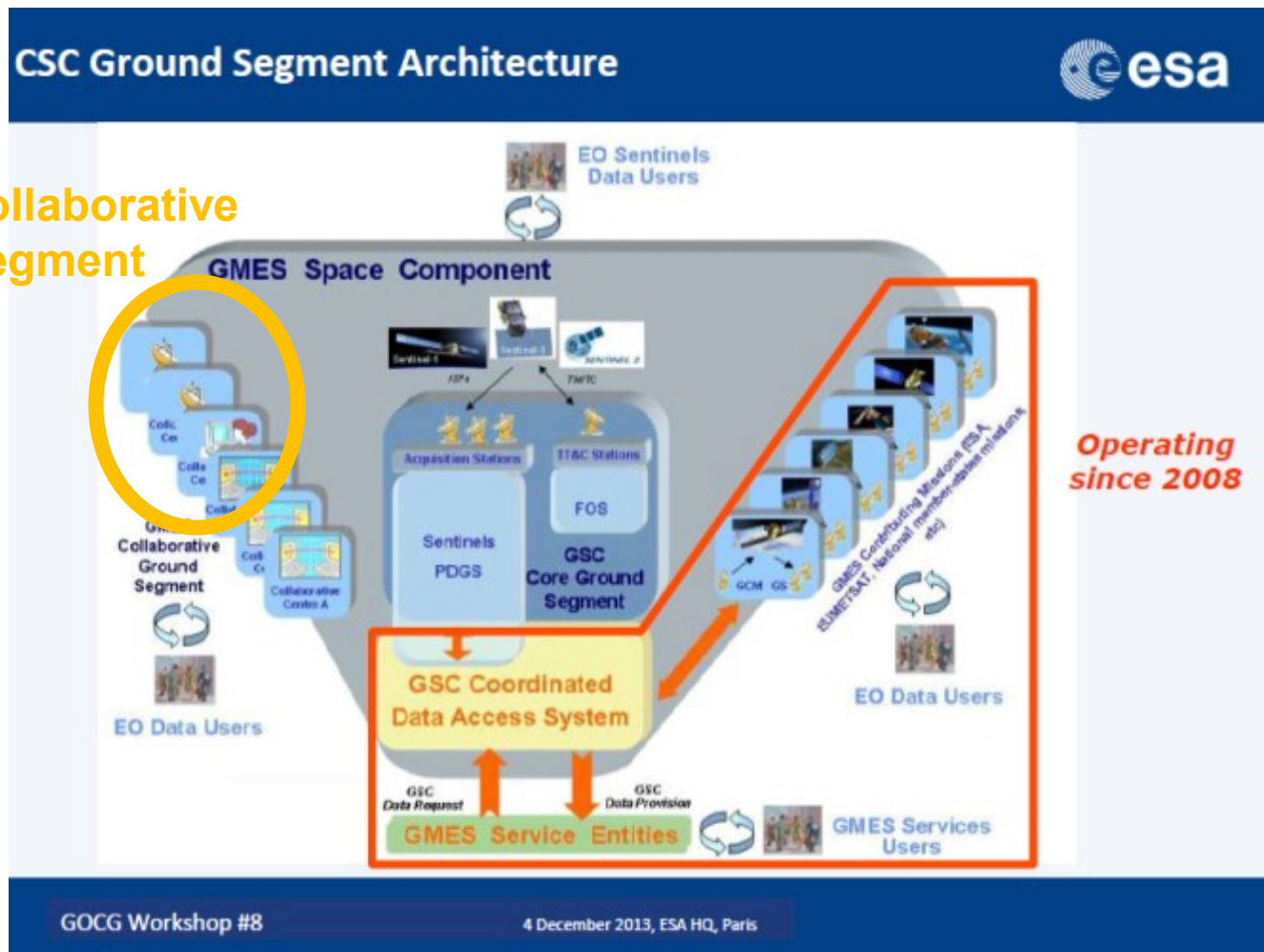
- Streamlined processing chains for data production
- Virtualization provides flexibility and scalability
- Cluster processing system (32 cores) for high performance computing
- Current archiving capacity >300TB
- Possibility to host both
  - External servers
  - Processing in virtual environment





# Copernicus Ground Segment

## Finnish Collaborative Ground Segment





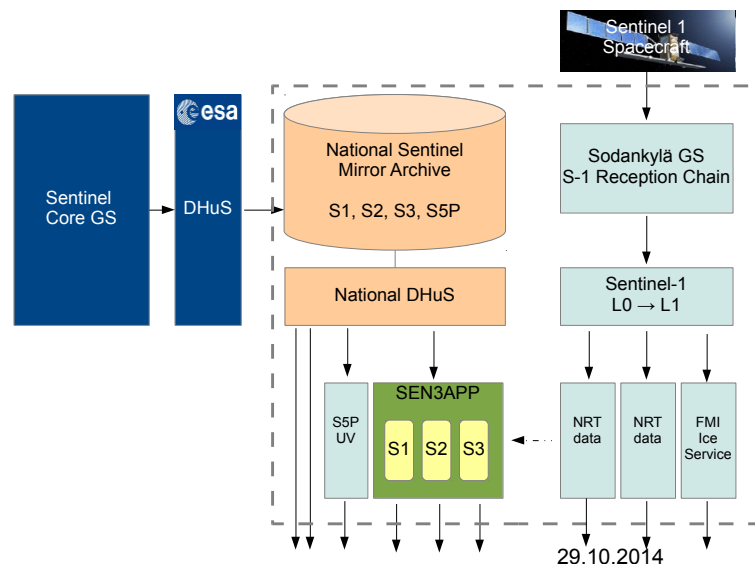
# Finnish Collaborative GS Initiative

## 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







# Development activities on-going

## • SPARK

- Collaborative Acquisition Station (CAS): Sentinel-1 local reception, Quasi-real time products from S-1
- Services to various fields: Arctic ocean, aviation, energy sector, etc

## • ENVIBASE

- Collaborative Archiving and Dissemination Centre (CAC)
  - Fast access to limited area data:
  - Long-term archiving
  - Data dissemination to customers
- Calvalus distributed processing system

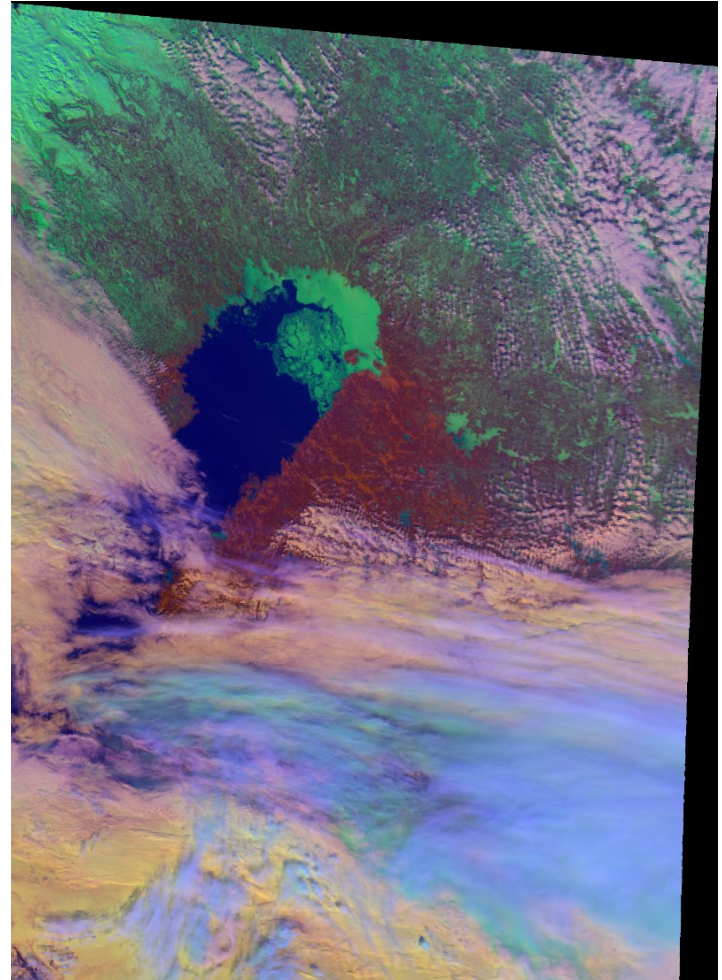
## • SEN3APP

- EU funded project
- Processing lines for cryospheric products, land cover/phenology applications

## • CryoBal-Thematic Exploitation Platform

- Infrastructure development for processing services close to data; IaaS, PaaS

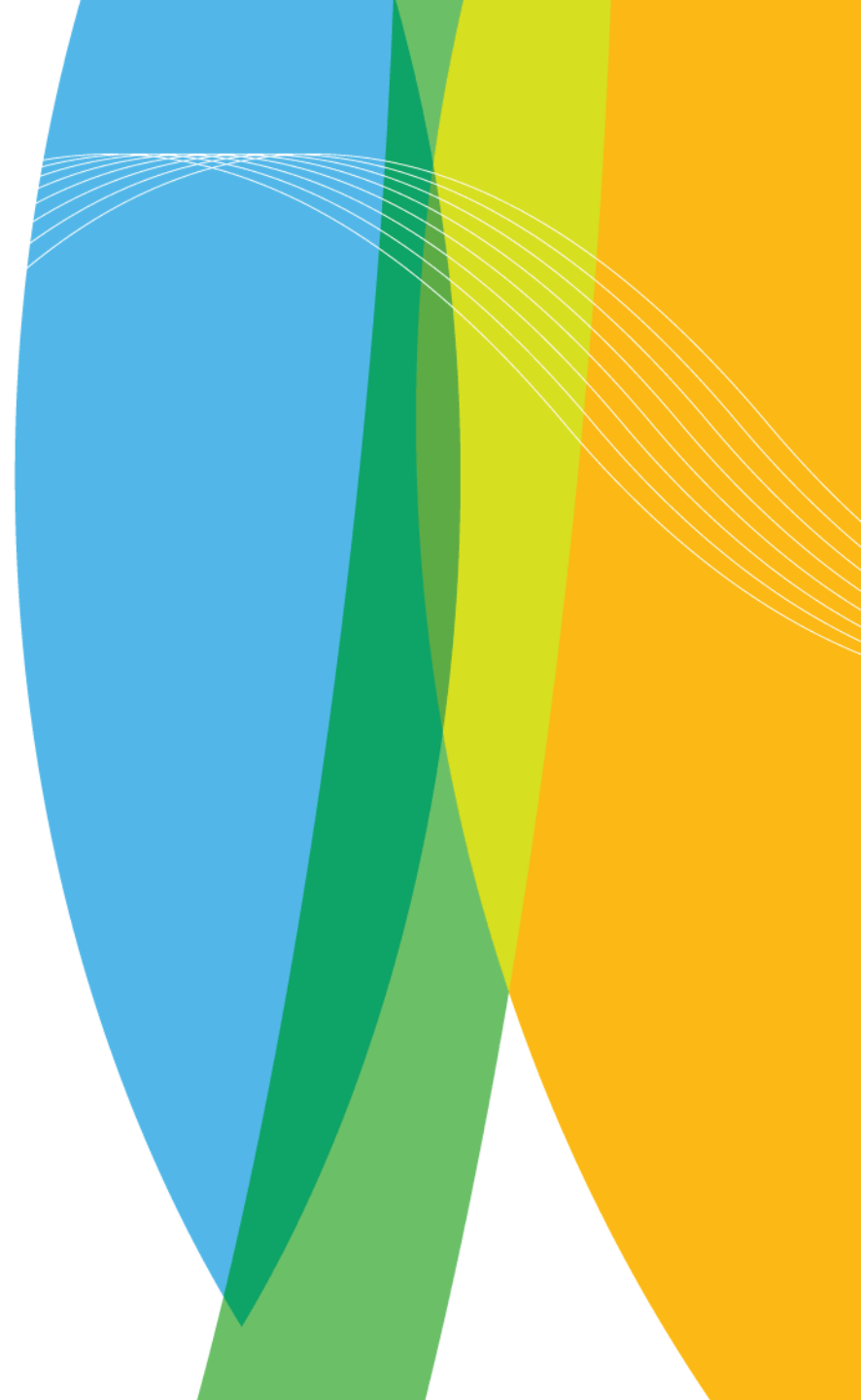
- **Data available for international partners also: Finland, Sweden, Estonia, Latvia, etc. have common interests**





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# Data products from Sodankylä NSDC

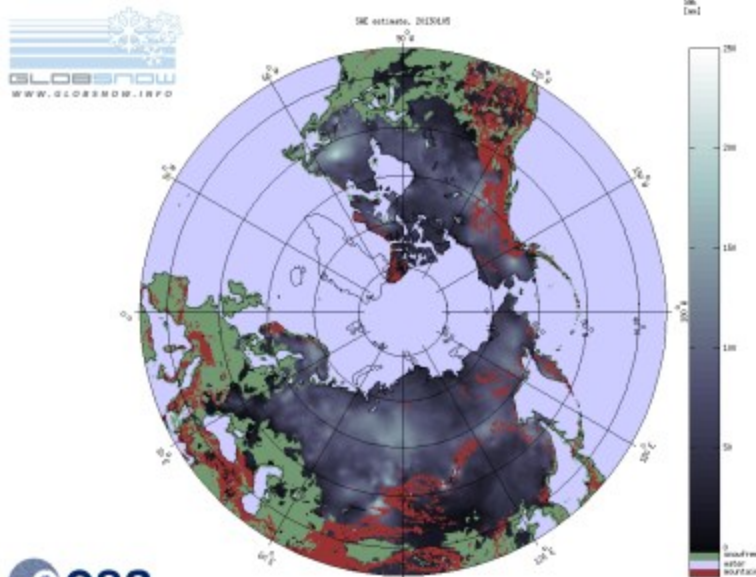




# ESA-GlobSnow – Operational Snow processing of Northern Hemisphere

## 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





# 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**

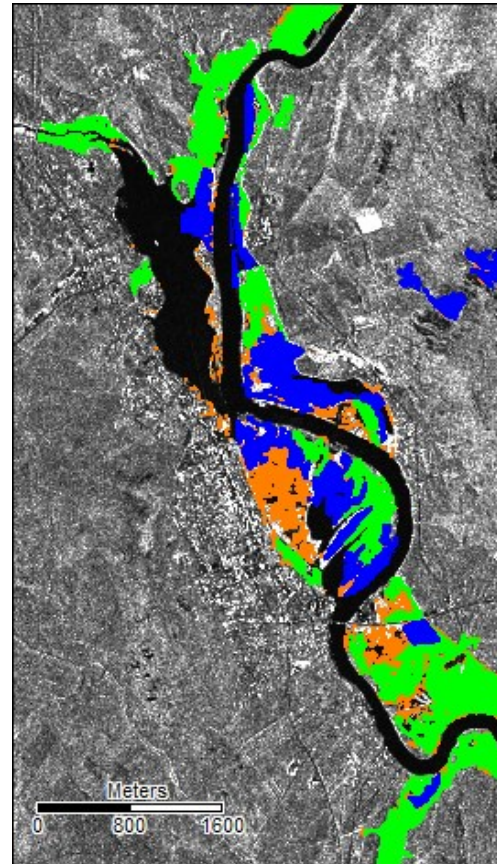




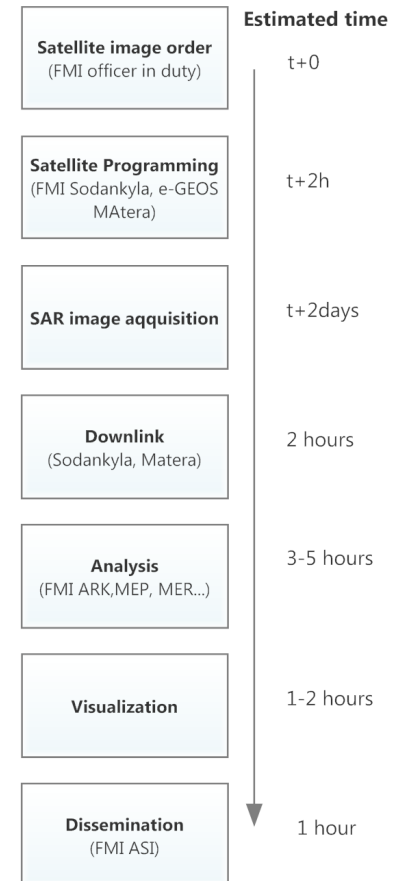


# SAR Flood Detection

- Open areas – SAR backscatter from water areas lower due to specular reflection on the water surface.
- Forests – SAR backscatter from flooded forests higher due to water-trunk reflection.
- Sparse/low-tree forests – Expansion of detected flood areas using other spatial data such as:
  - high resolution DEM
  - Forest data (tree height and canopy closure based on LiDAR)
  - Land cover information



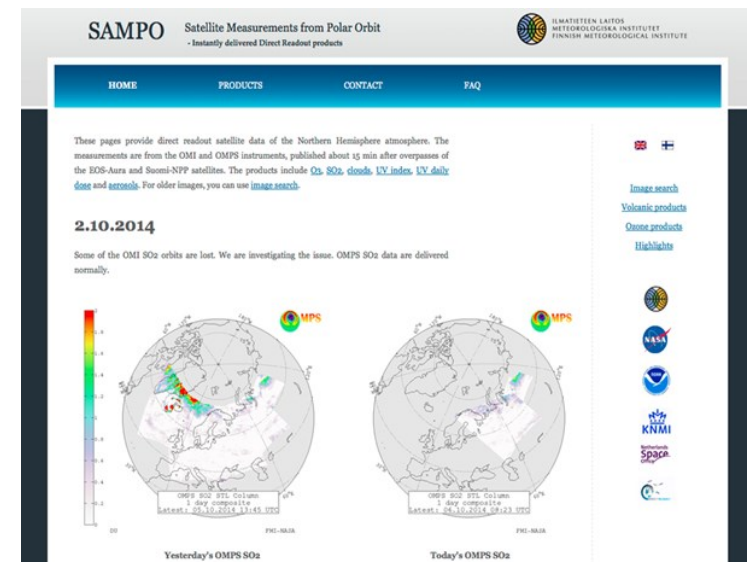
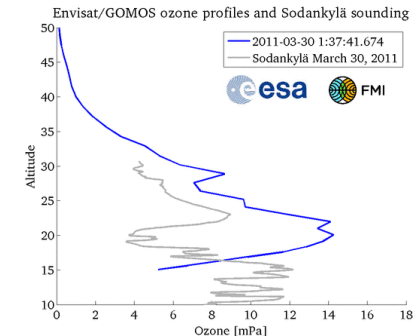
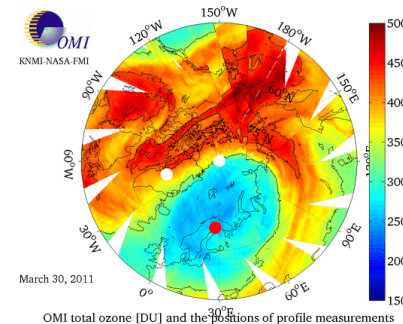
Blue: Floods in open areas  
Green: Floods in forests  
Orange: Floods in sparse/low-tree forests





# Atmospheric data products

- **Near real-time provision of**
  - Atmospheric ozone and UV-radiation products from OMI and OMPS
  - Volcanic ash products (SO<sub>2</sub>)
  - Clouds and aerosols
- **Data available within minutes in internet**
  - [sampo.fmi.fi](http://sampo.fmi.fi)



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