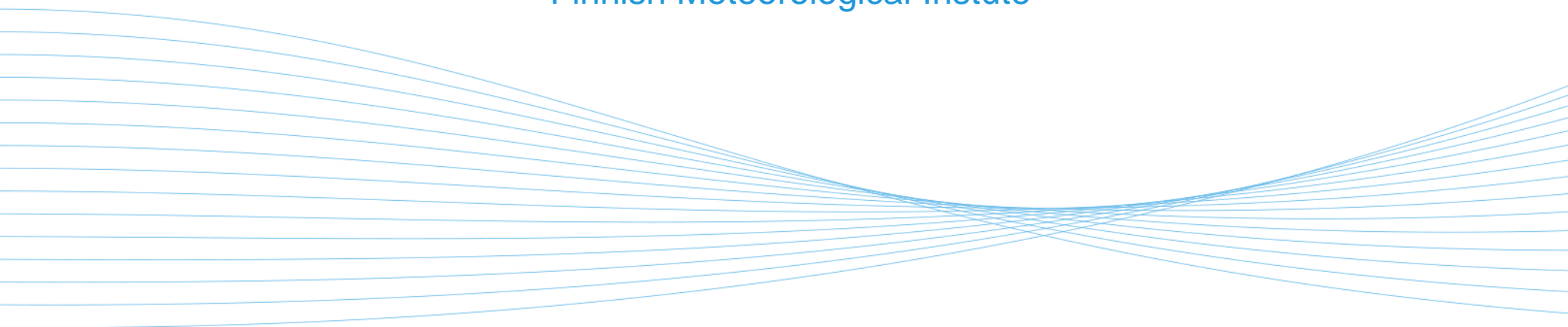




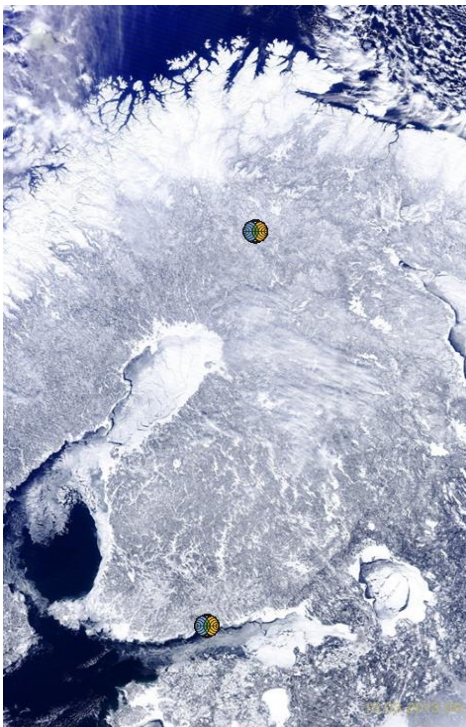
ILMATIETEEN LAITOS
METEOROLOGISKA INSTITUTET
FINNISH METEOROLOGICAL INSTITUTE

National Satellite Data Centre and Finnish Sentinel Collaborative Ground Segment

Jyri Heilimo
Finnish Meteorological Institute



Sodankylä National Satellite Data Centre



National satellite data centre providing satellite data reception, archiving and processing services to Finnish and international partners



Copernicus – European Earth Observation Programme

- Copernicus is a European system for monitoring the Earth
- Programme collects data from multiple sources: satellites and in situ sensors
- Six thematic areas:
 - land, marine, atmosphere, climate change, emergency management and security
- Main users: policymakers and public authorities, but also European Citizens





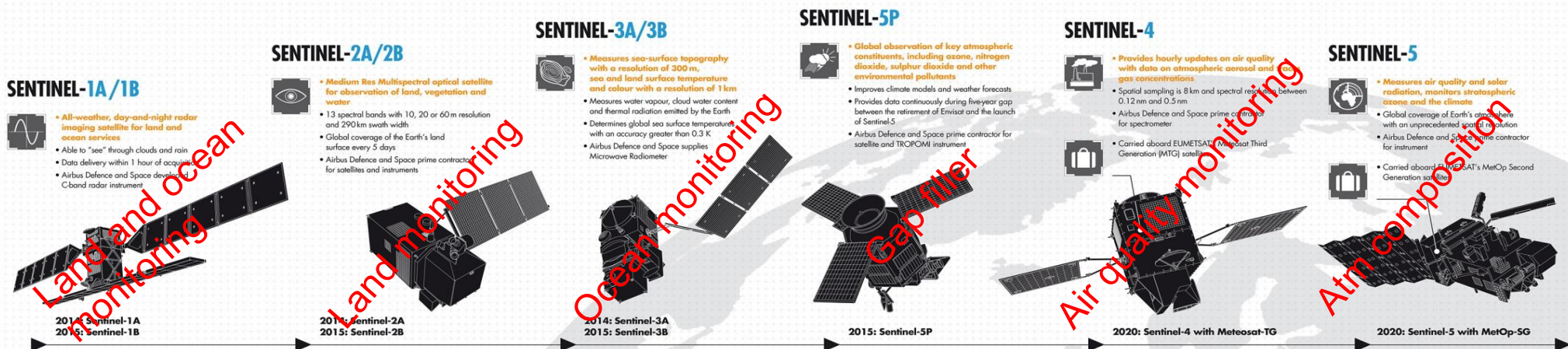
Copernicus Space Segment: The Sentinels

- Series of next-generation Earth observation missions
- Each mission will focus on a different aspect of Earth observation; Atmospheric, Oceanic, and Land monitoring, and the data will be of use in many applications.

COPERNICUS AND ITS 5 SENTINELS

Observing our planet for a safer world. The European Earth Observation Programme Copernicus provides geo-information products and services based on satellite imagery.

- Known as **GMES** until 2012 - Global Monitoring for Environment and Security
- 30 Public and Private missions are also contributing data
- 16 years of development and testing
- Five Sentinel-Missions at the heart of the space component
- Civil Security:** Allowing early warning and crisis prevention in conflict and disaster areas
- Emergency Management:** Accurate and timely data for emergency plans and rescue for disaster management
- Land Surface Monitoring:** Geographical information on land cover, related variables and urban development
- Marine Environmental Monitoring:** Observations and forecasts on the state of the physical oceans and regional seas
- Climate Change Monitoring:** Helps to understand the reason for climate change, rising sea levels and melting ice caps
- Earth Atmosphere Monitoring:** Daily information on the global atmospheric composition and when Sentinel-4 is in service this will be hourly



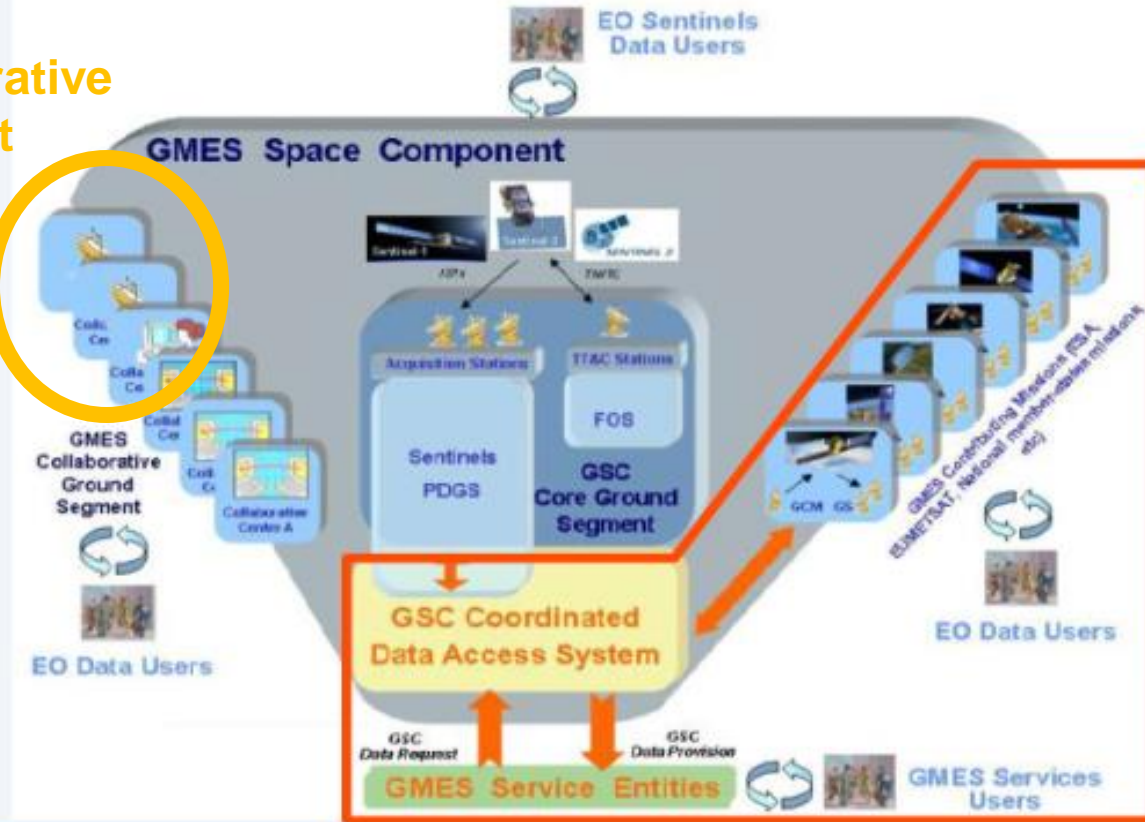


Copernicus Ground Segment

CSC Ground Segment Architecture



**Finnish Collaborative
Ground Segment**

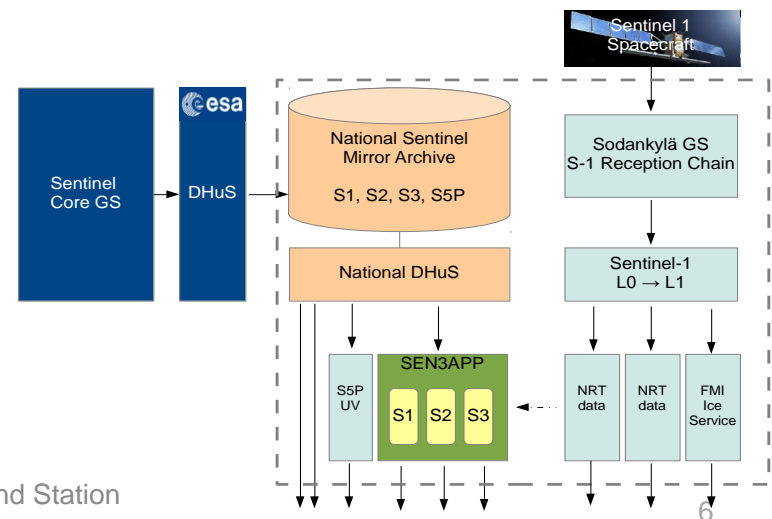
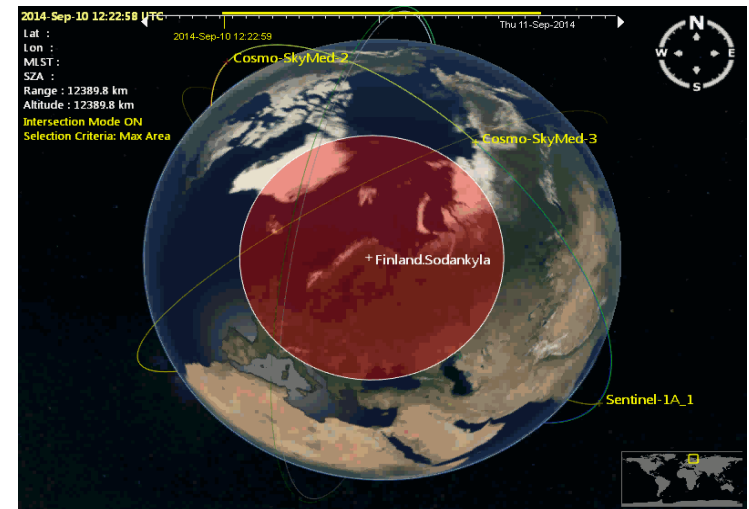


Operating since 2008



Finnish Collaborative GS Initiative

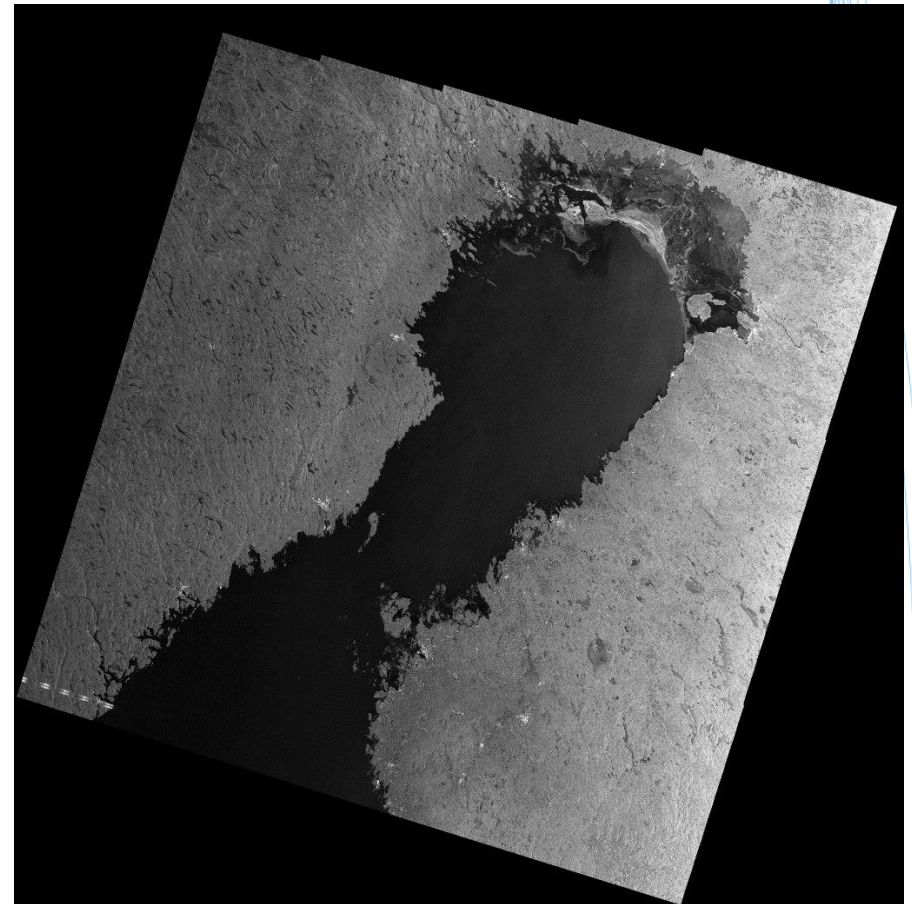
- Dissemination of Sentinel data to all users in Finland and neighbouring countries
 - Enhance use of EO data and collaboration
 - Batch pre-processing of the data
 - Provide NRT / QRT data processing services to users
 - Long-term archiving the Sentinel-data for scientific use
-
- Finnish CollGS will have
 1. Collaborative Acquisition Station
 2. Collaborative Archiving Centre





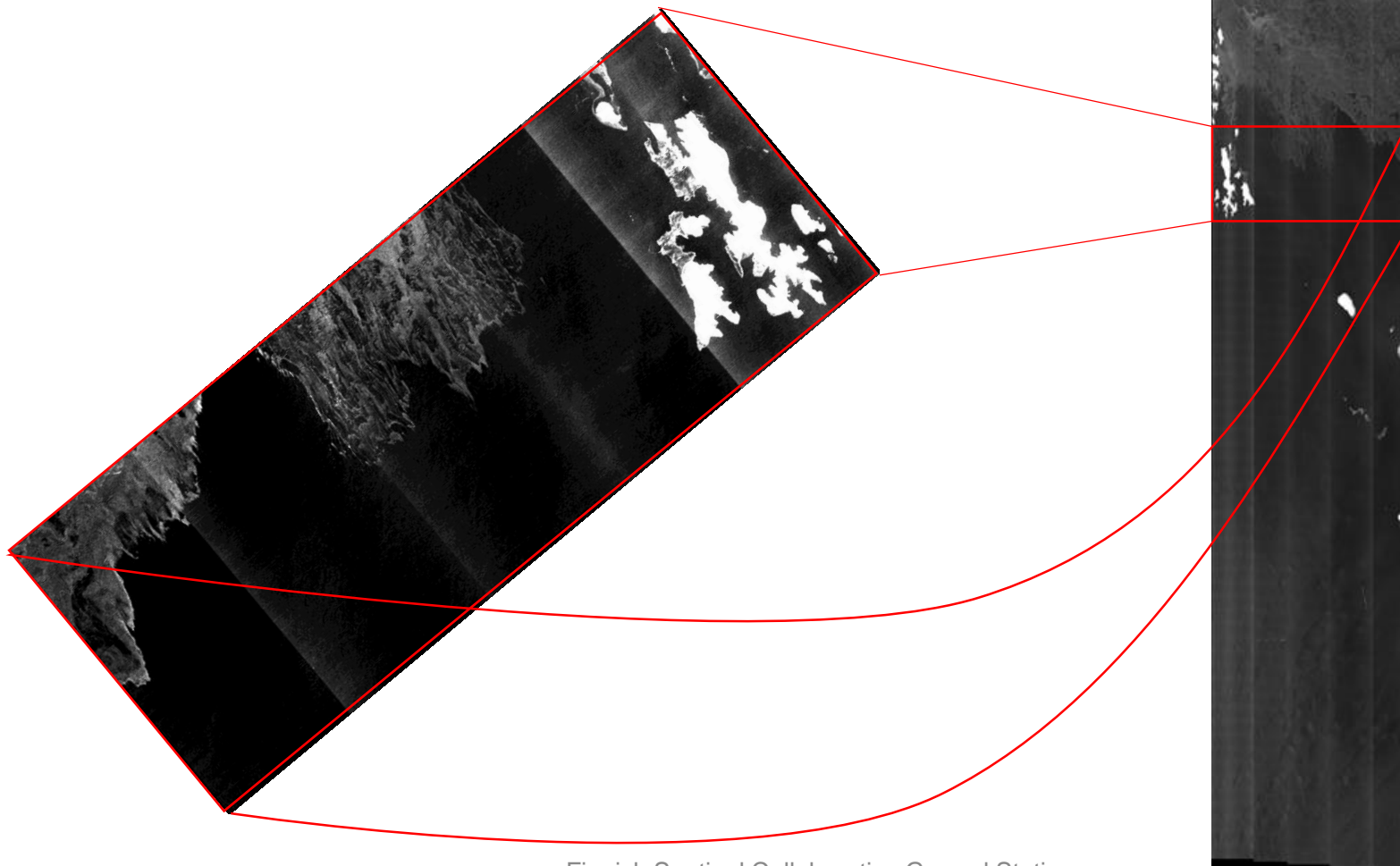
Sentinel Collaborative Acquisition Station

- Local downlink of Sentinel-1 pass-through data to Sodankylä ground station
- Focus on NRT / QRT products
 - Automated processing lines to enable very fast data delivery
 - Data push directly to users
 - Processes monitored 24/7
- Current QRT data users:
 - Baltic Sea Ice Service,
 - Oil spill monitoring
- Current development status
 - Satellite downlink system OSAT Successful in Nov 2015
 - First S1A image downlinked at Sodankylä





First S1A image acquired during OSAT

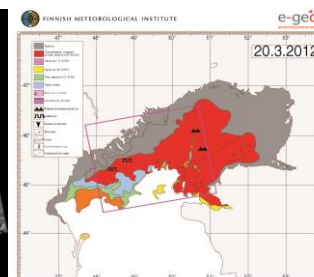
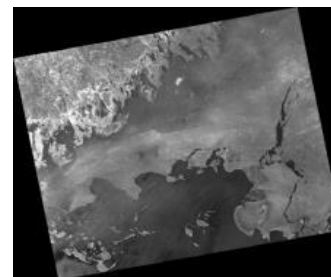


23.10.2015

Finnish Sentinel Collaborative Ground Station
Jyri Heilimo / FMI

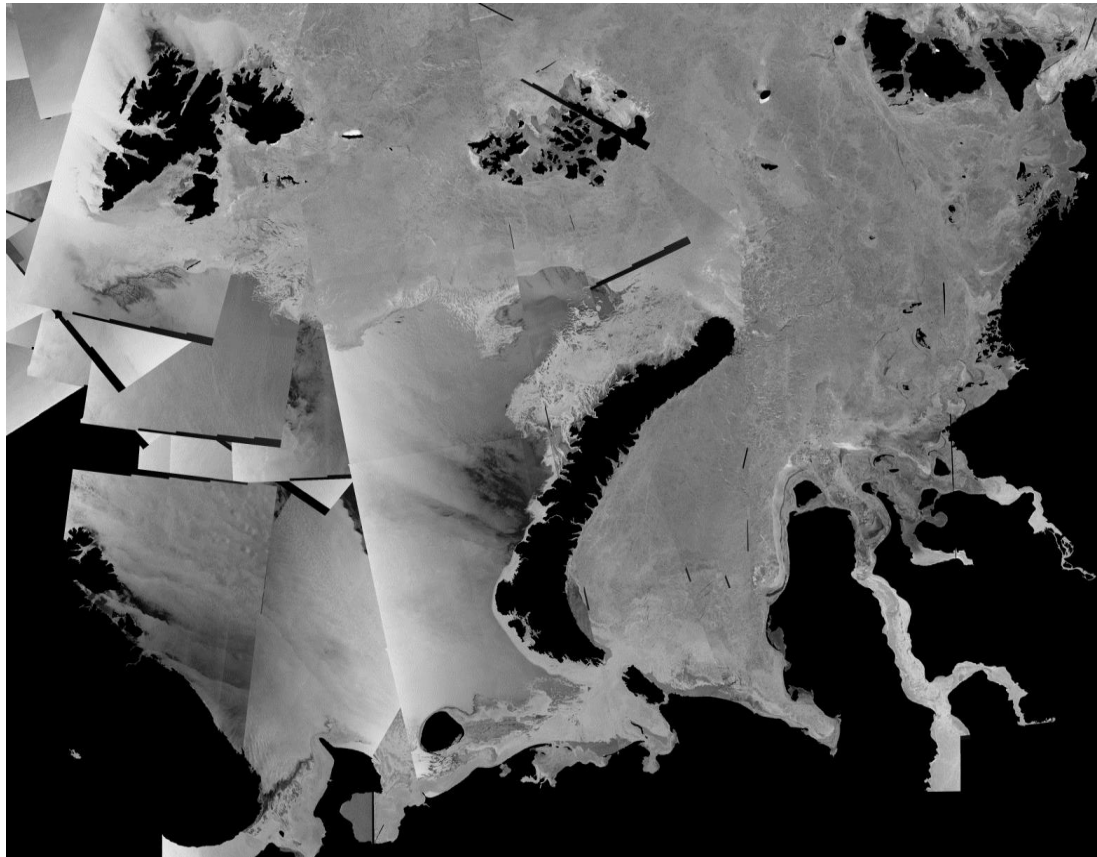
Sample Service: Baltic Sea Ice Charting

- 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
 - Daily products for ice breakers and ships
 - Previously RSAT2 used.
COSMO-SkyMed used occasionally
 - **Near real-time Sentinel-1** data from Sodankylä NSDC starting Winter 2015
 - Provided for Finnish and Swedish icebreakers. Estonian icebreakers under negotiation.





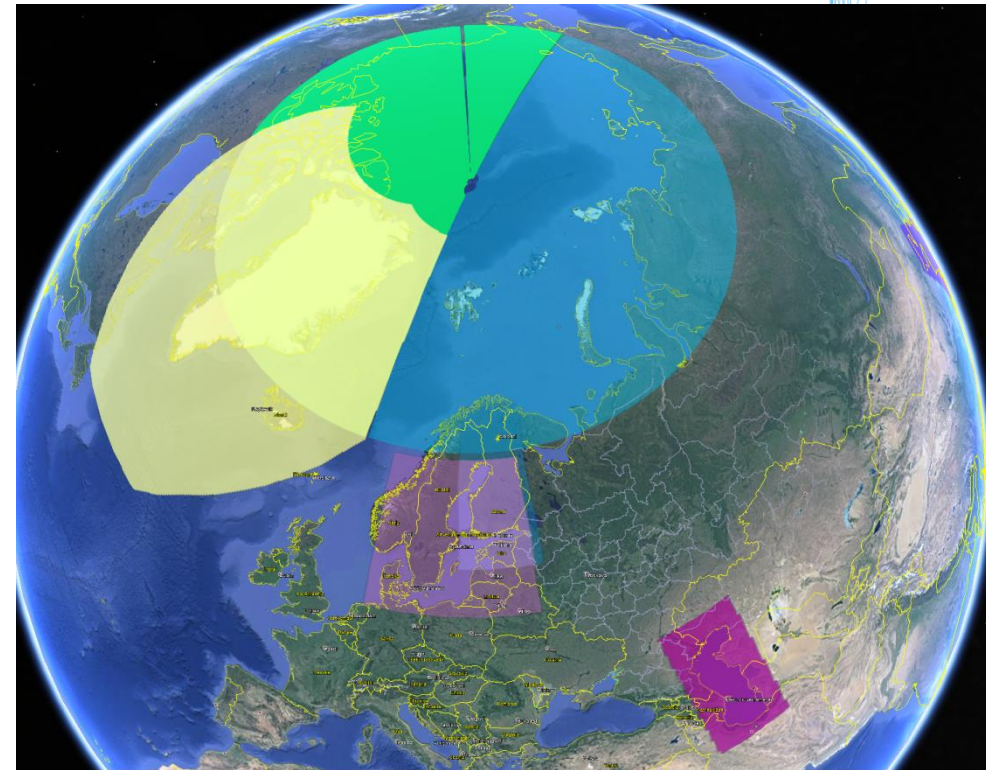
Sentinel-1 SAR mosaic over the Barents and Kara Seas, 1 Mar 2015





Sentinel Collaborative Archiving Centre

- Mirrors a subset of Sentinel data
 - S1, S2, S3 and S5-P
- Provision of Sentinel data to Sentinel data users in Finland and in neighbouring countries free of charge
- Batch processing of the data to national grid
- Medium-term archive (3-6 months) available on-line
- Long-term data archive (6+ months -) off-line
- Automated data processing lines for specific and local area products
 - E.g. water quality, snow extent, Global UV
 - Hosting of external processing services
- Development status:
 - DHuS installation planned Winter 2015
 - Calvalus installation planned Autumn 2015



Sentinel-1 AoI



Sentinel-2

- Archiving and dissemination of Sentinel-2 to national EO data users
- Automatic batch processing to Finnish DEM (planned)
 - L1C uses 90m SRTM
 - L1A -> KM10/KM25
- Water quality processing
- Calvalus cluster processing system for large data sets and long time series processing
- Sentinel-2 data download to NSDC starts once routinely available from ESA.

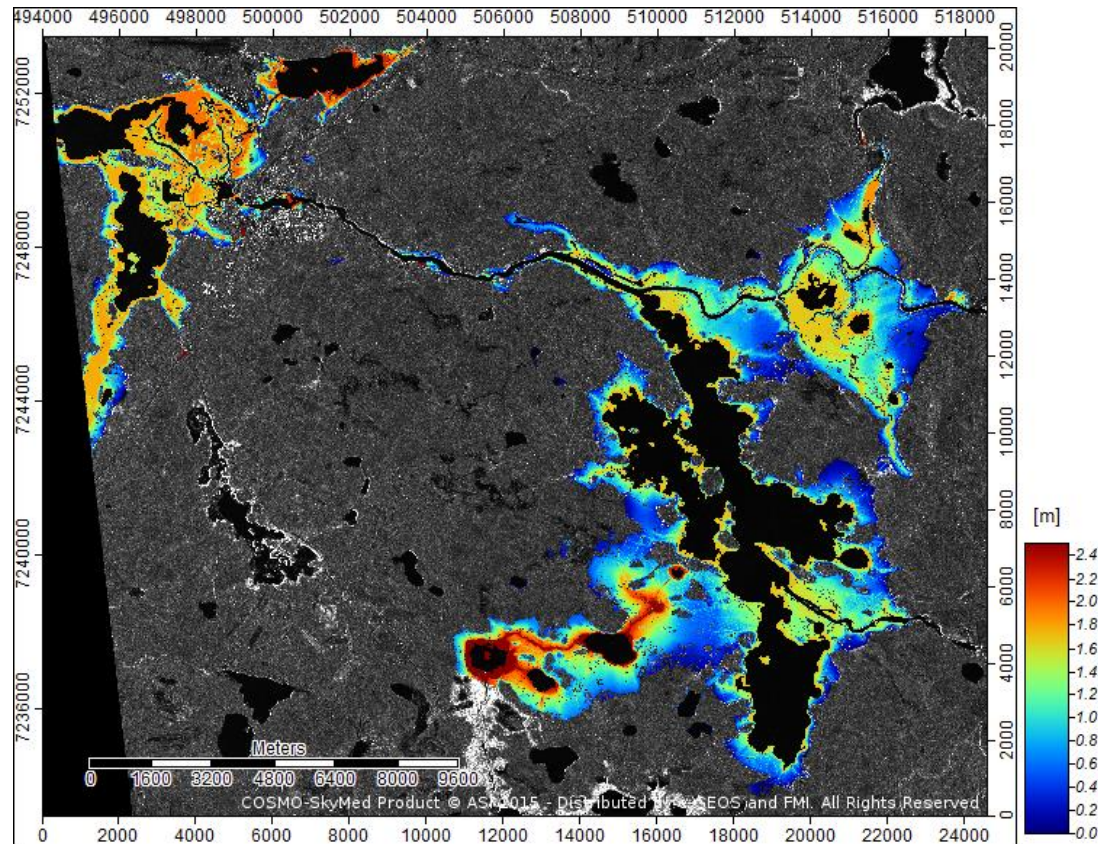


Sentinel-2 Aoi

Sample Service: Operative Flood detection with Sentinel-1

- Flooding rivers and lakes are easily detected from SAR images
- Floods in forests and in urban areas are more difficult
- Operative flood analysis has been tested in 2012-2014
- Part of operative procedure in 2015.

- Pros compared to aerial imagery:
 - Higher availability and independence to weather and darkness
 - Coverage
 - Faster analysis





Satellite data availability from FMI Arctic Research

Current operational (free access)

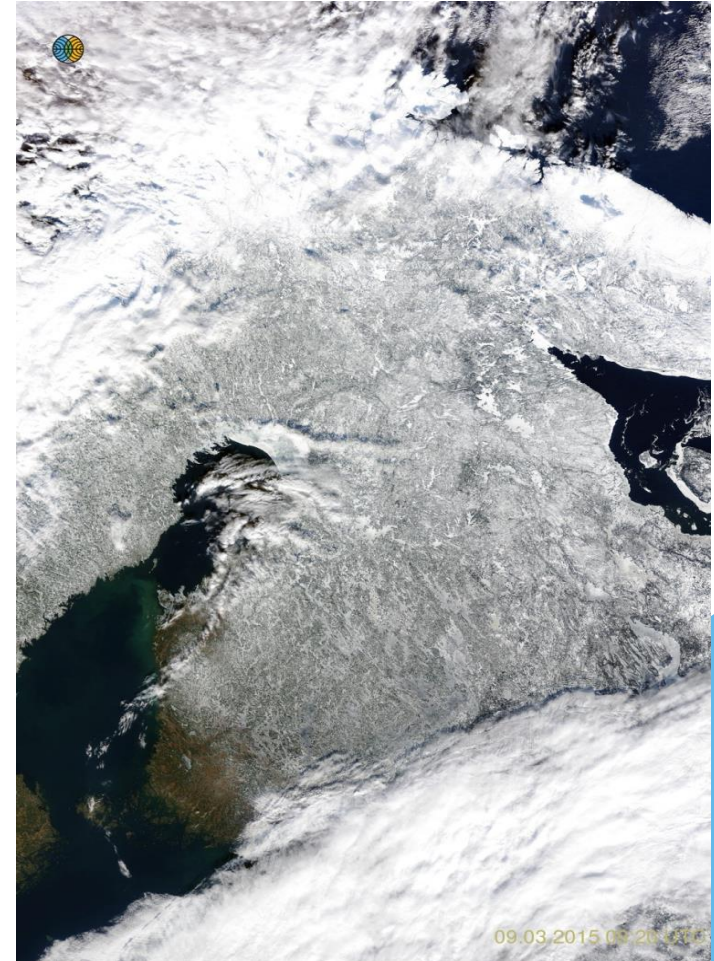
- EOS-Terra/MODIS
- EOS-Aura/OMI
- Suomi-NPP/VIIRS & OMPS

Current operational (commercial)

- COSMO-SkyMed (SAR) 1-4

Future

- **Sentinel-1 Collaborative Acquisition Station (CAS):**
Sentinel-1 QRT delivery from local downlink
- **Collaborative Archiving and Dissemination Centre (CAC)**
Sentinel-1/2/3/5P National Mirror Site
Sentinel-1 already pre-operational



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