



Sodankylä National Satellite Data Center (NSDC):

Current and Future Satellite
Missions and Products

Timo Ryyppö,
CSPP Users' Group Meeting 2015

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- Introduction to Sodankylä site
 - Facilities
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- Processing software
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 - Other software
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Sodankylä National Satellite Data Centre

Finnish Meteorological Institute – Arctic Research Centre (FMI-ARC)



National satellite data center (NSDC) provides satellite data reception and data processing services to Finnish and international partners



2.4 m System	Item	7.3 m System
2.4 m X-band Cassegrain	Reflector	7.3 m X-band Cassegrain
Hemispherical No keyholes	Coverage	Hemispherical No keyholes
7.7 – 8.5 GHz	Frequency	7.7 – 8.4 GHz
22.8 dB/K	G/T	≥31.2 dB/K
RHCP/LHCP	Polarizations • Data • Tracking	RHCP+LHCP RHCP/LHCP
0.1° 0.03°	Accuracy • Pointing • Tracking	0.06° 0.04°
Auto and Program Track	Tracking	Auto and Program Track
Radome	De-/anti-icing	Electrical heating
NASA EOS and S-NPP	Satellite support	LEO > 250 km, MEO, GEO
1	Data channels	2
0.665 to 20.8 Mbps	Data rate	2 to 320 Mbps (expandable)
Fully automated	Station control	Fully automated
2003	Operational	2011
Data distribution using 10 Gbps data link		





Computer facility

- **Full scale computer building for processing of satellite and environmental data**
- **Security and Safety standards according to ESA data processing requirements.**
 - UPS + backup generator
 - Dual cooling and air-conditioning
 - Fire extinguisher system
- **High speed 10 Gbit /s network connection between Sodankylä and Helsinki (HQ)**





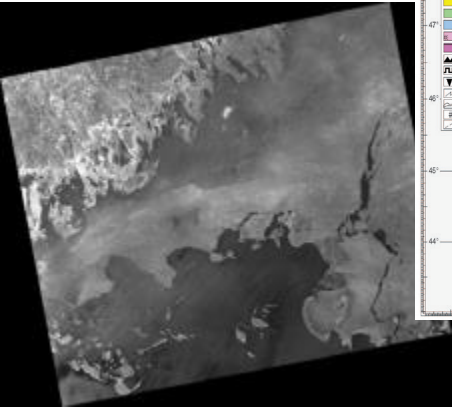
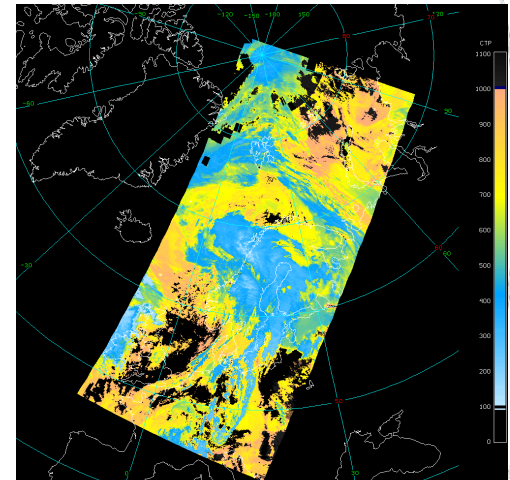
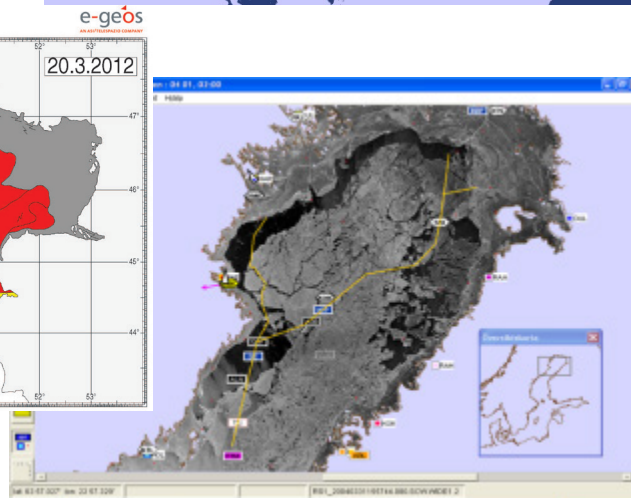
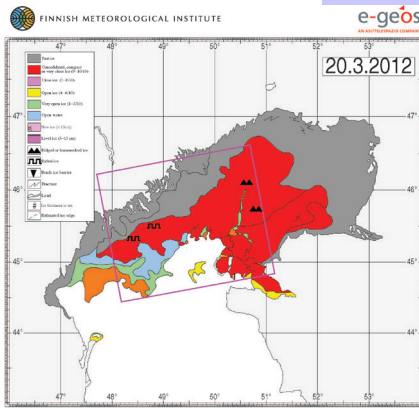
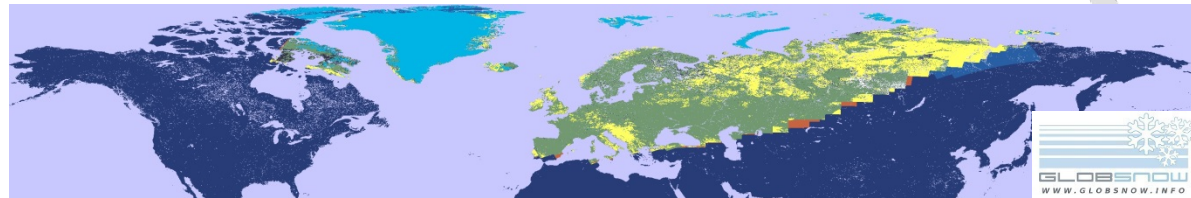
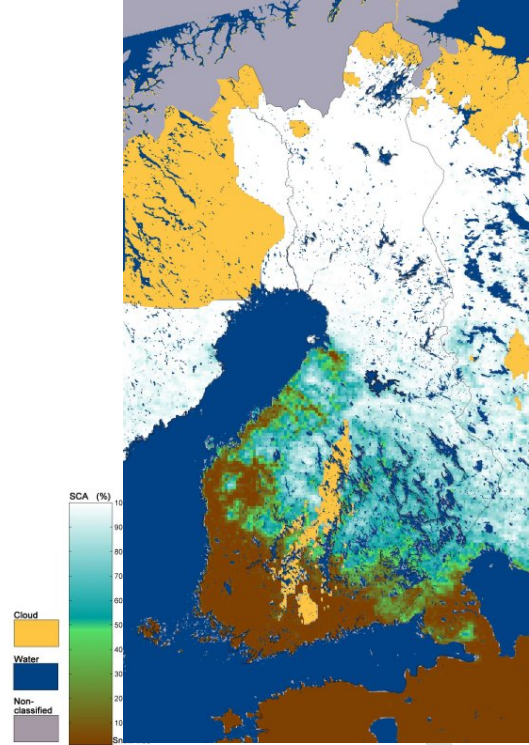
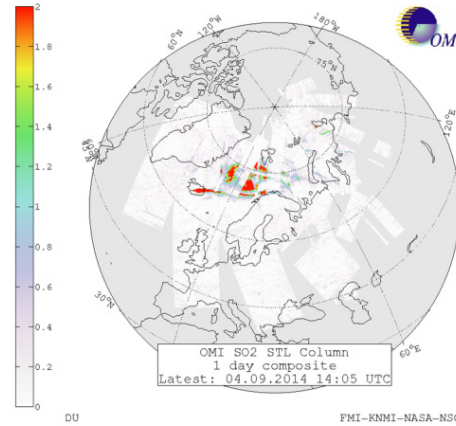
Satellite data availability from Sodankylä NSDC

Free access

- EOS-Terra and Aqua/**MODIS**
- EOS-Aura/**OMI**
- Suomi-NPP/**VIIRS & OMPS**
- FY-3B/C/**MERSI**

On-demand (commercial)

- COSMO-SkyMed/**SAR**
(4 satellite constellation)

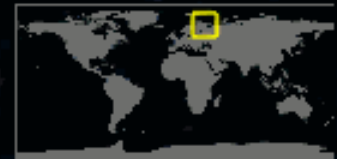
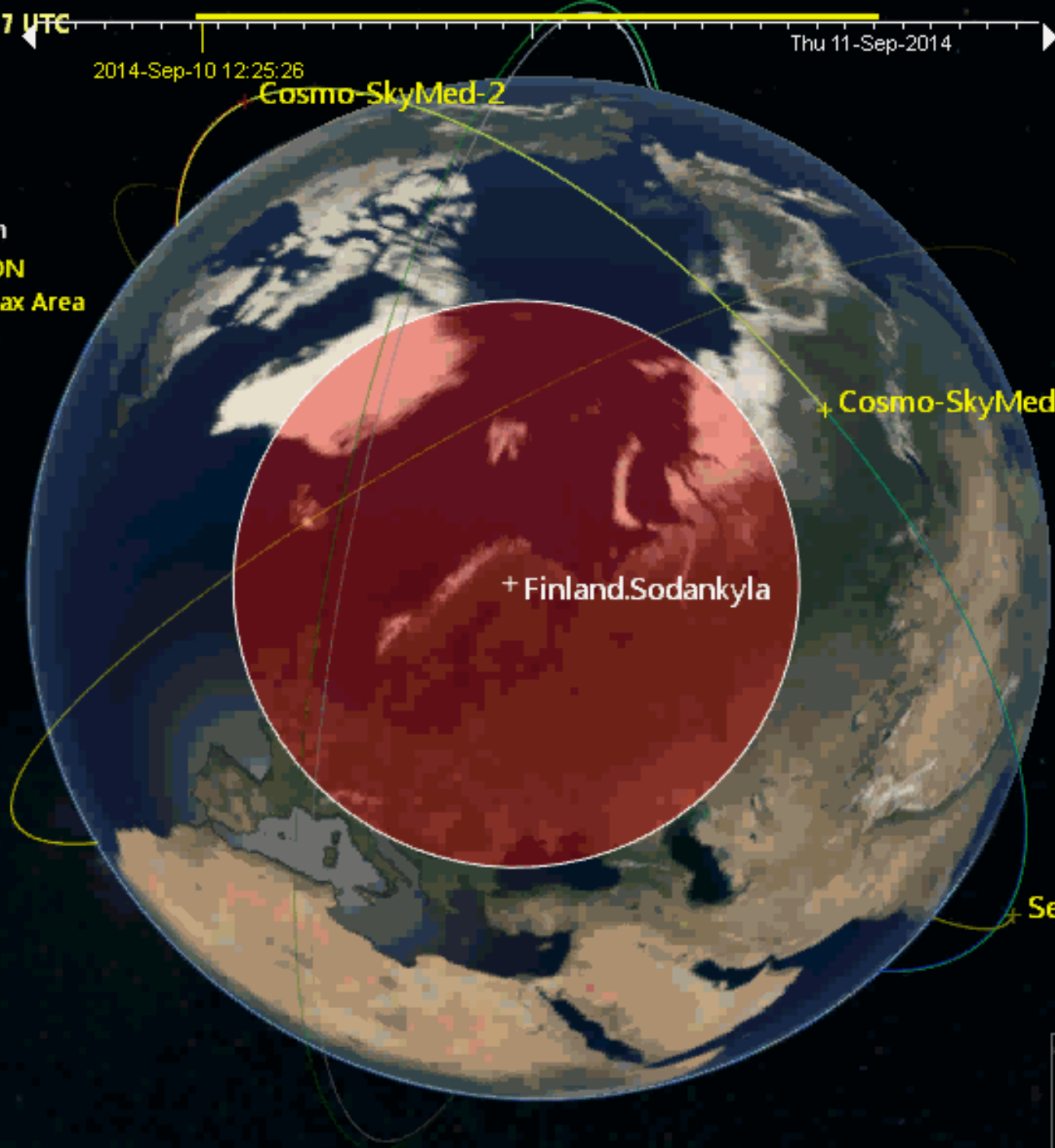


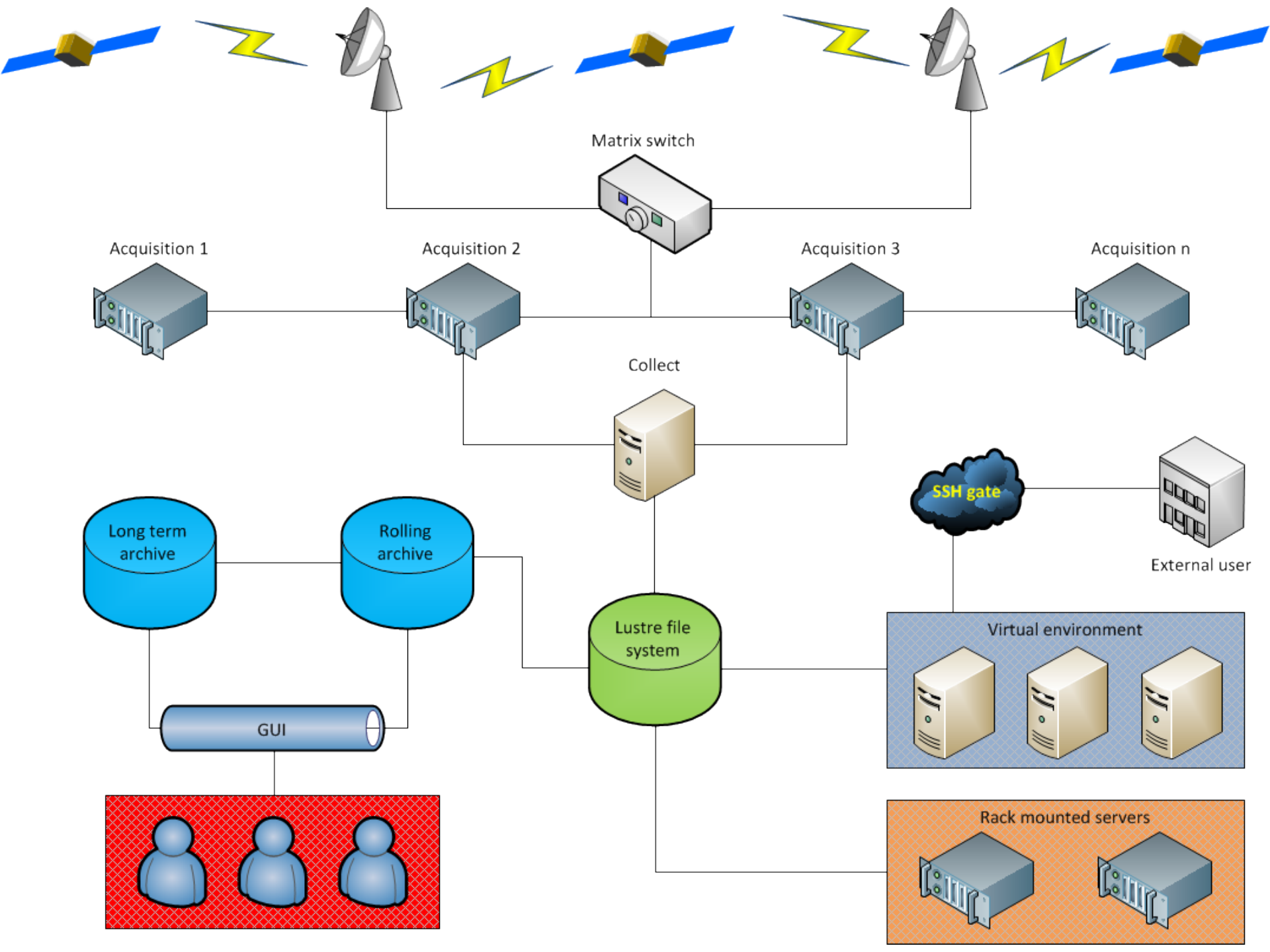
2014-Sep-10 12:24:57 UTC

Thu 11-Sep-2014

Lat :
Lon :
MLST :
SZA :
Range : 12389.8 km
Altitude : 12389.8 km

Intersection Mode ON
Selection Criteria: Max Area

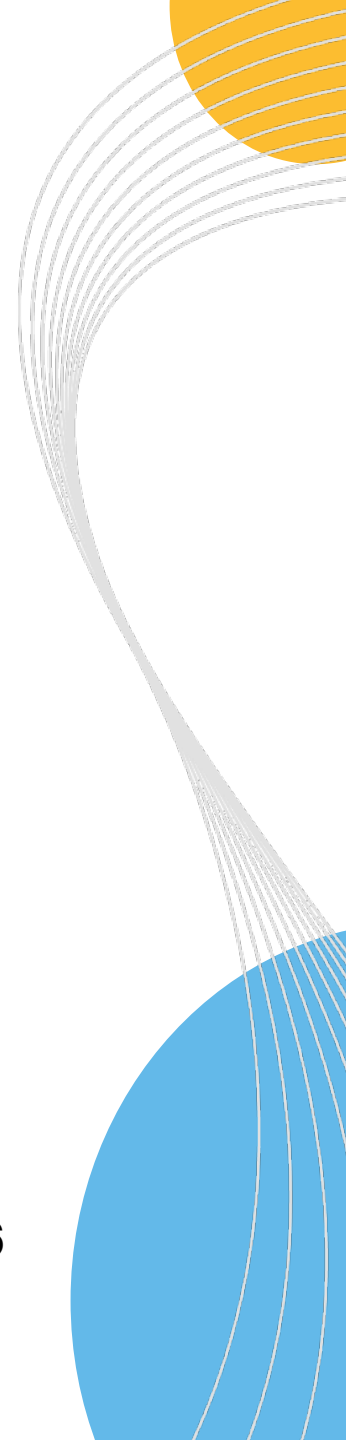






IMAPP and CSPP usage at FMI

- IMAPP
 - Since 2008
 - Fully automated processing chain 2009 together with RT-STPS and MODIS L1 DB
 - Daily products and images
- CSPP
 - Since 2012
 - First as a beta tester
 - Daily SDR and EDR products
 - Processing an overpass to L1 takes 25 min (SDR 2.0.)
 - 10 cores (2.53 GHz), 144 GB mem
 - Need for granuled processing like RT-STPS 5.1 with DB6 patch





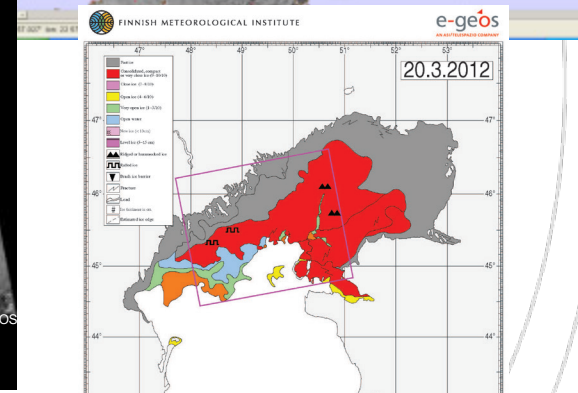
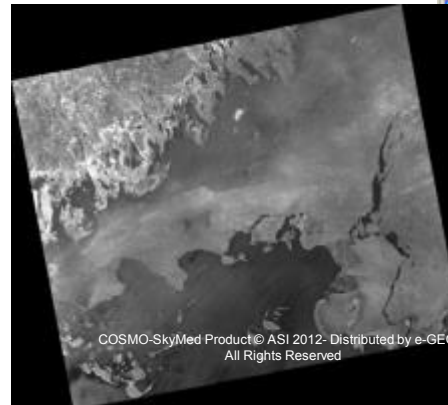
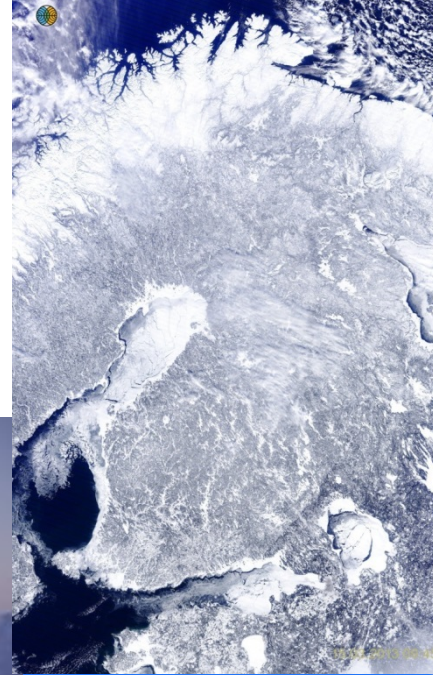
First Suomi NPP image using CSPP
software was processed by FMI

March 5th 2012



Baltic Sea Ice Charting and Monitoring

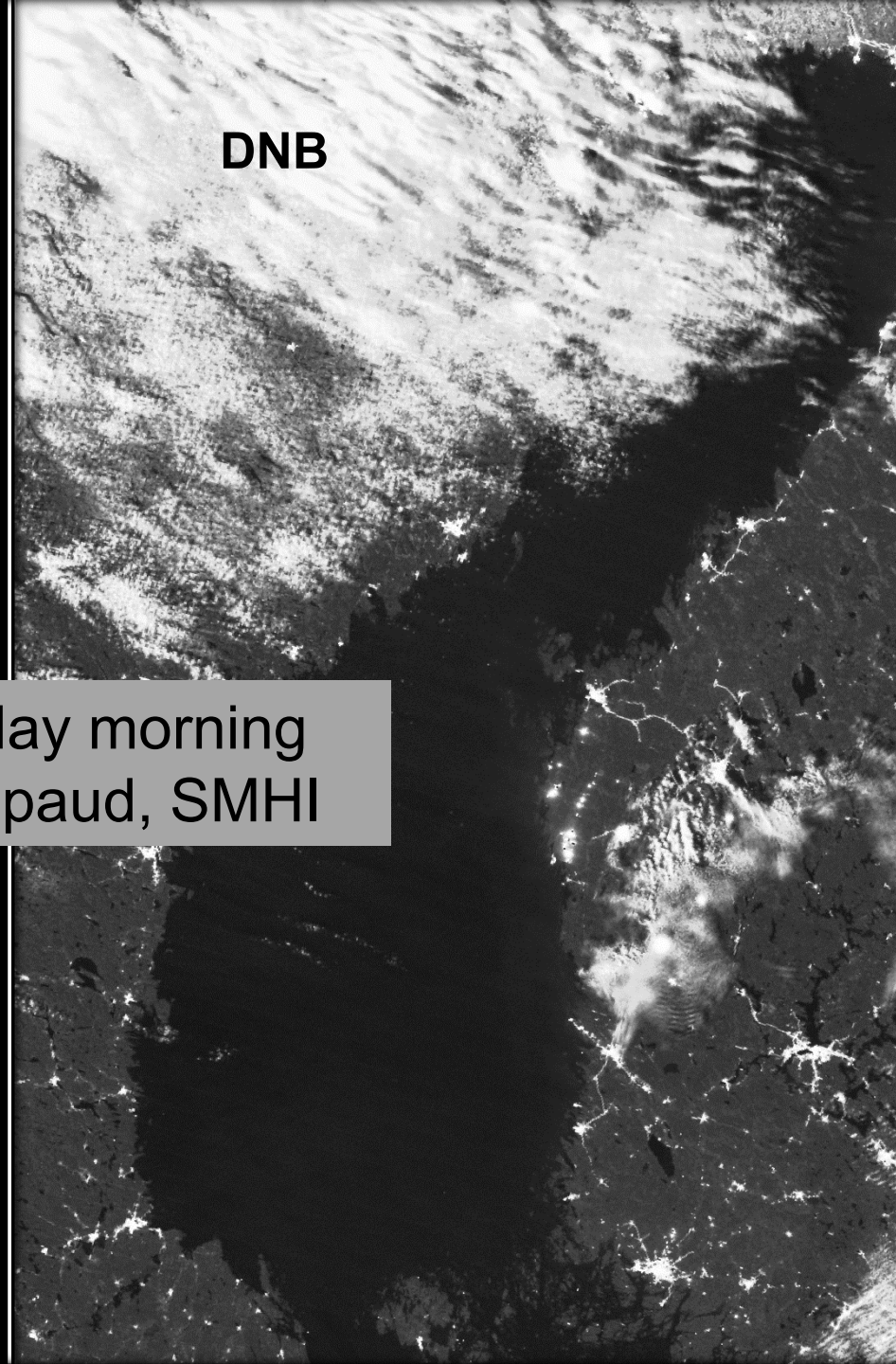
- Commercial and environmental needs
 - Finland is essentially an island
 - ~90% of Finland's import and export via sea routes
 - Gulf of Finland is one of the most busiest marine routes for oil transport
- Satellite data for sea ice charting
 - Optical and radar satellite data combined with in-situ data
 - S1 and S-NPP Day-Night-Band data welcomed addition
- Daily products for ice breakers and ships



RGB: I3, I2, I1

DNB

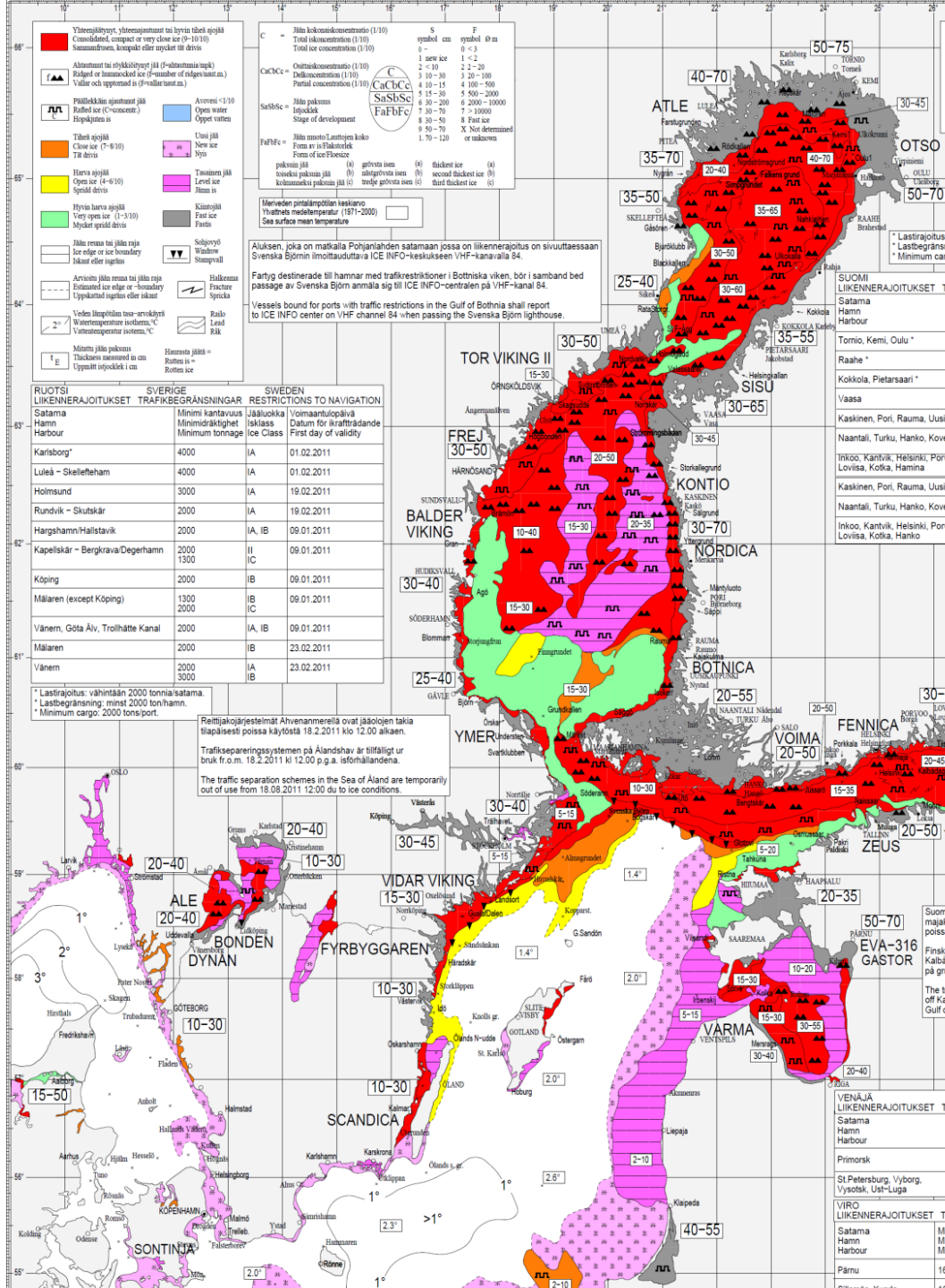
On Thursday morning
Martin Raspaud, SMHI





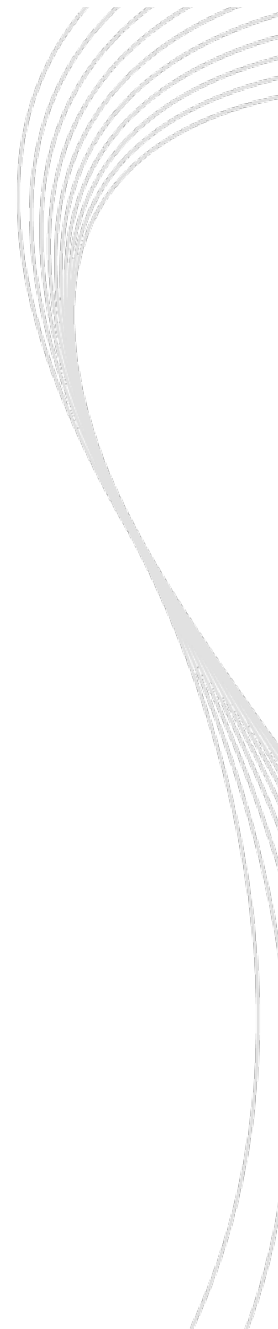
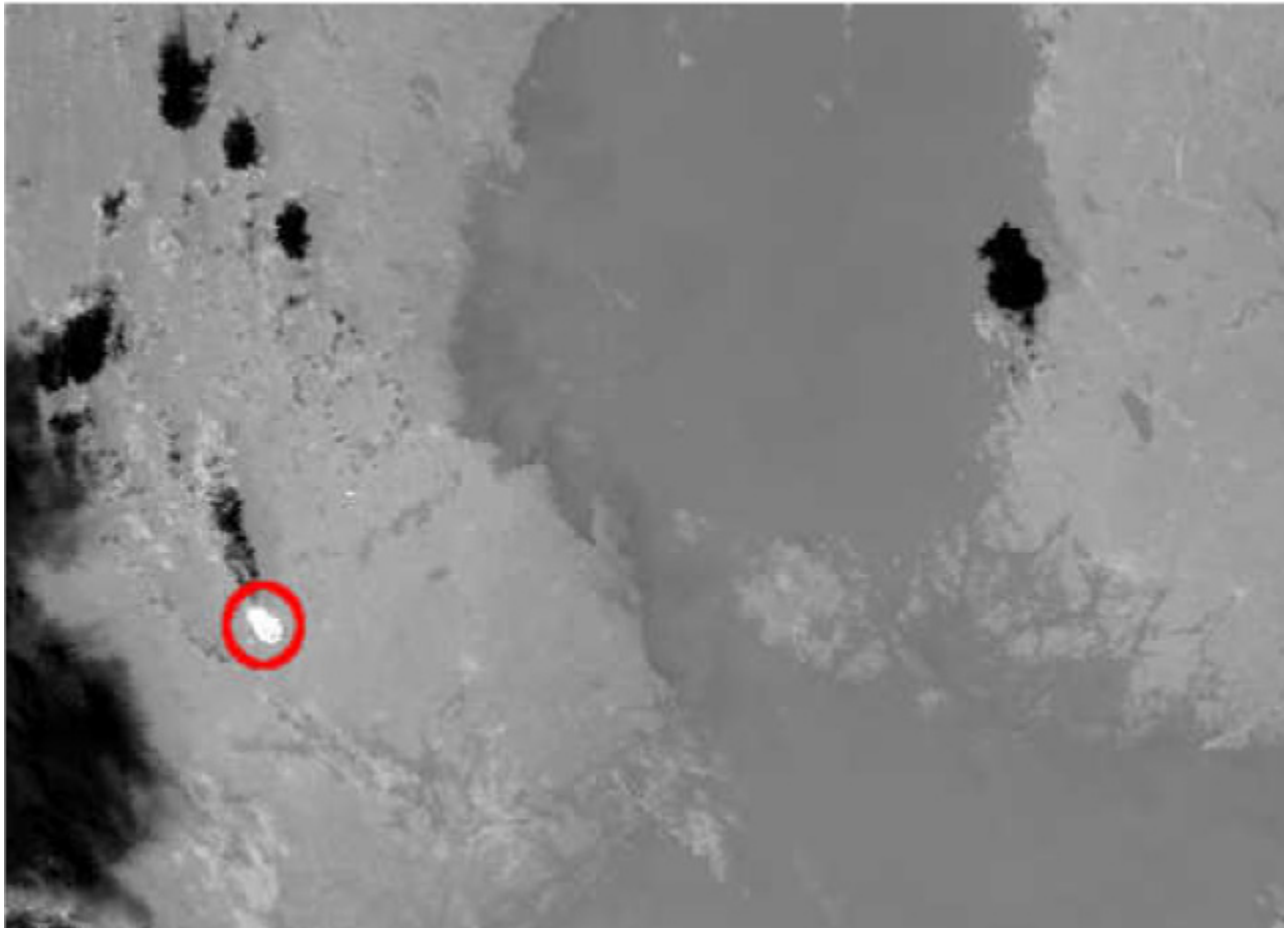
Baltic Sea ice coverage

Winter	Date	Coverage
14/15	23.1.	51 000 km ²
13/14	7.2.	100 000 km ²
12/13	15.3.	177 000 km ²
11/12	11.2.	179 000 km ²
10/11	25.2.	315 000 km ²
09/10	17.2.	244 000 km ²
08/09	20.2.	110 000 km ²
07/08	24.3.	49 000 km ²
06/07	23.2.	139 000 km ²
05/06	16.3.	210 000 km ²
04/05	16.3.	177 000 km ²
03/04	11.3.	152 000 km ²
02/03	5.3.	232 000 km ²
01/02	1.2.	102 000 km ²





Forest Fire Detection with Satellite Sensors AVHRR, MODIS, and VIIRS





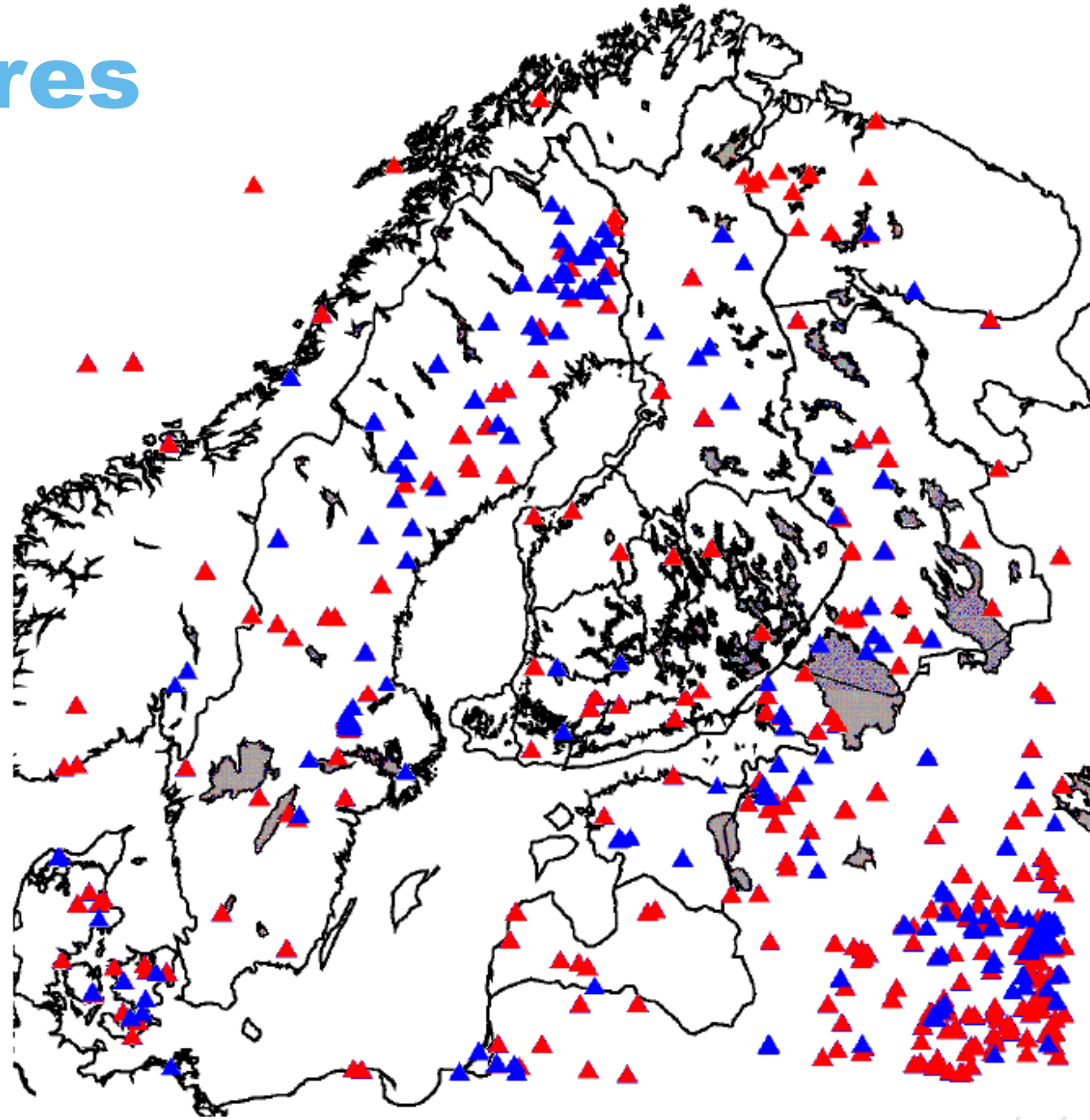
Forest fires in 2014

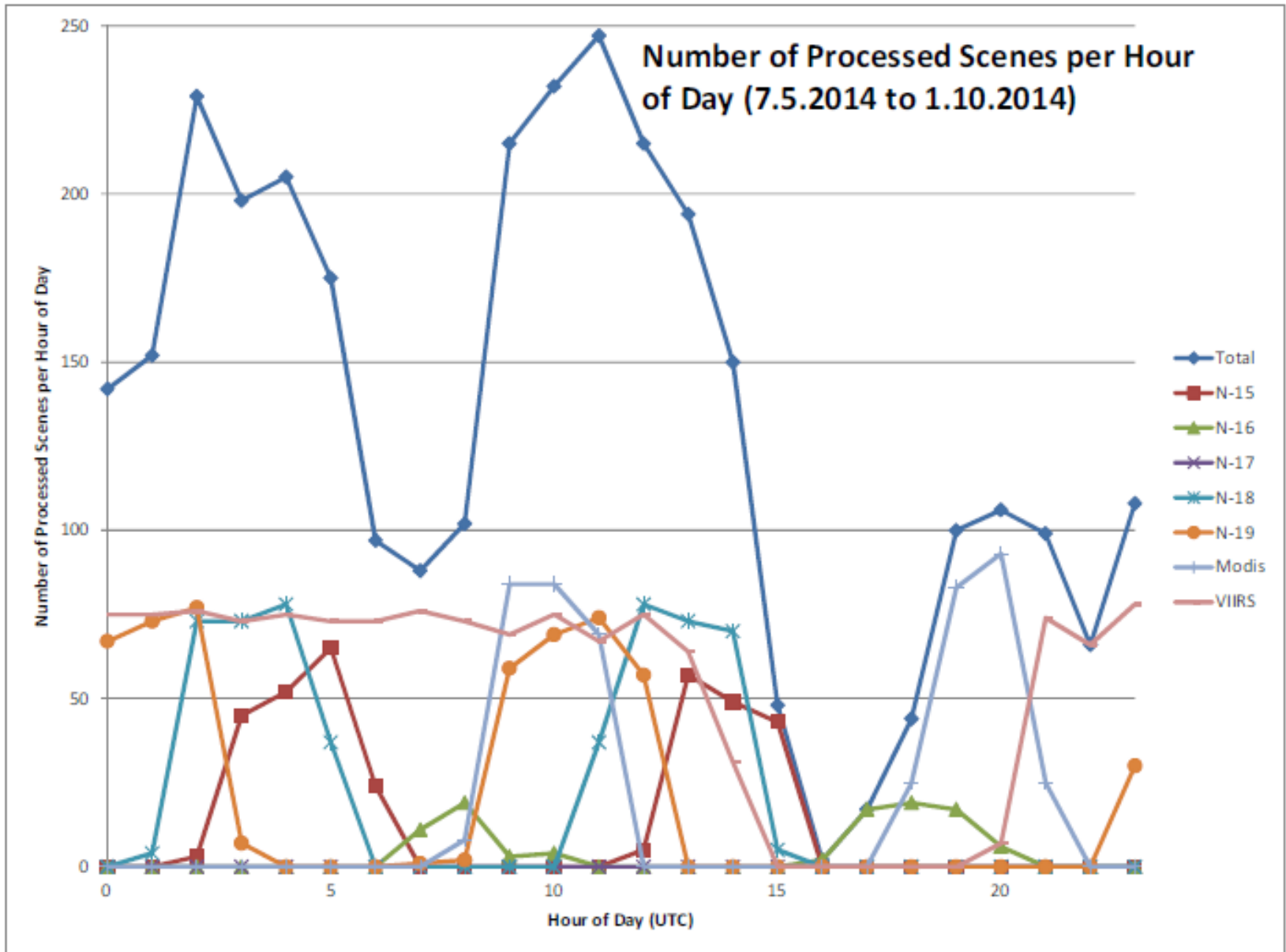


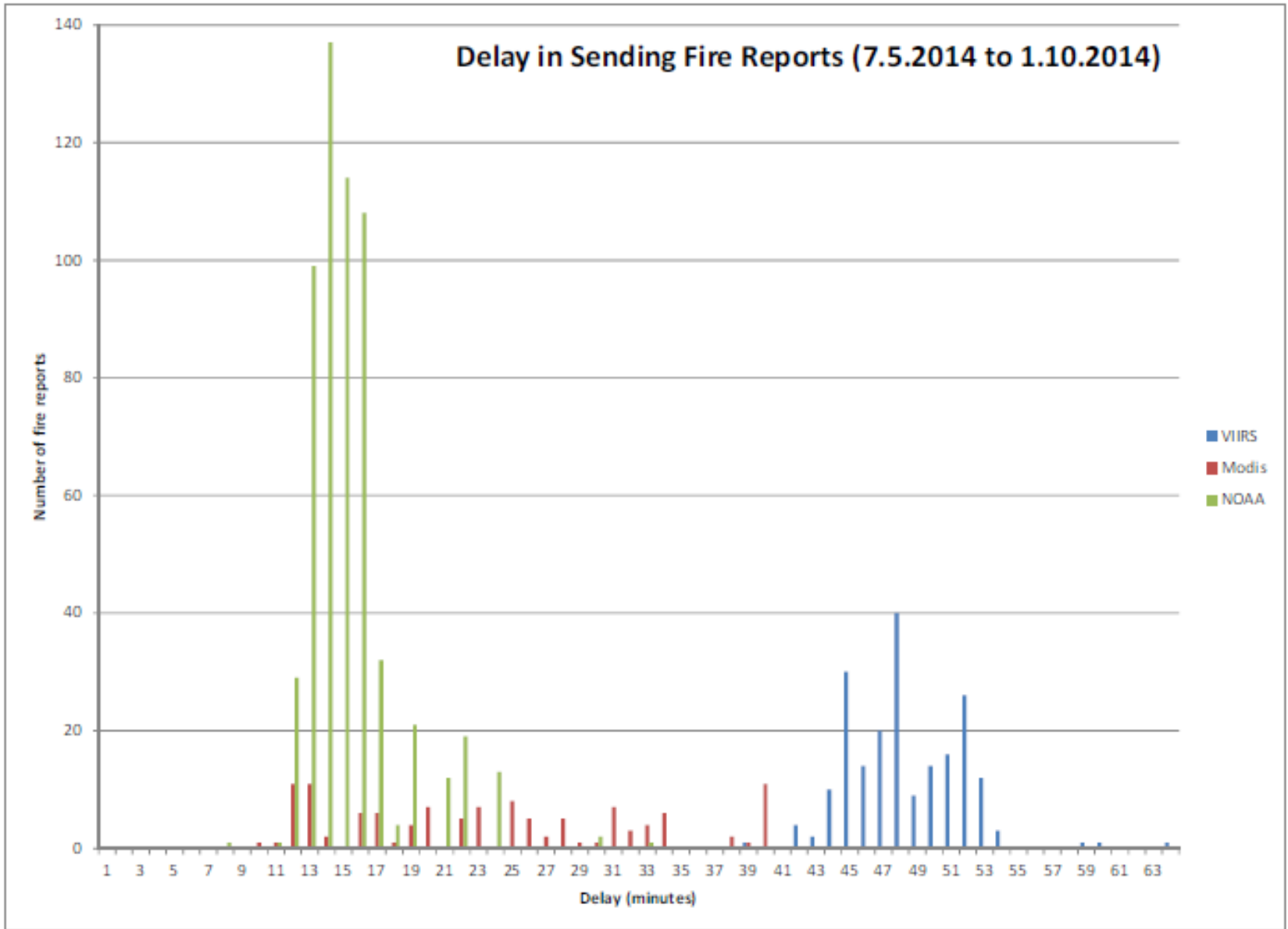
AVHRR



MODIS/VIIRS

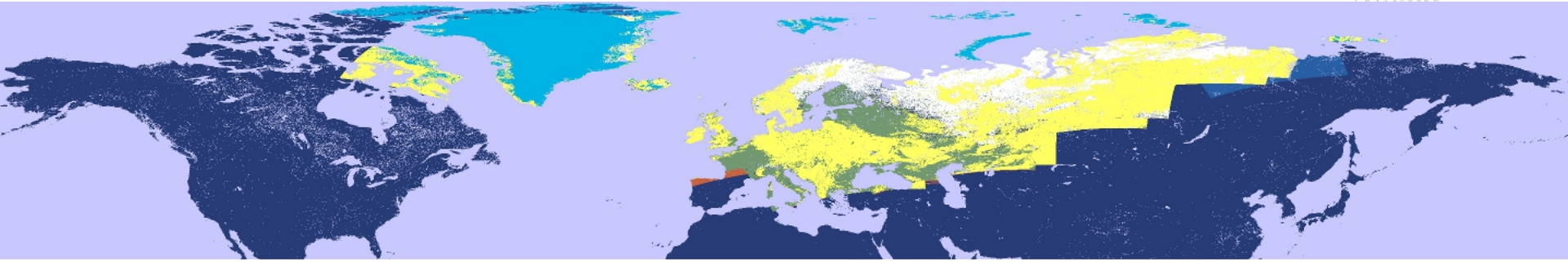






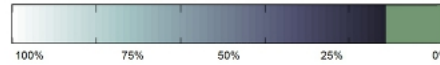


VIIRS Snow Extent

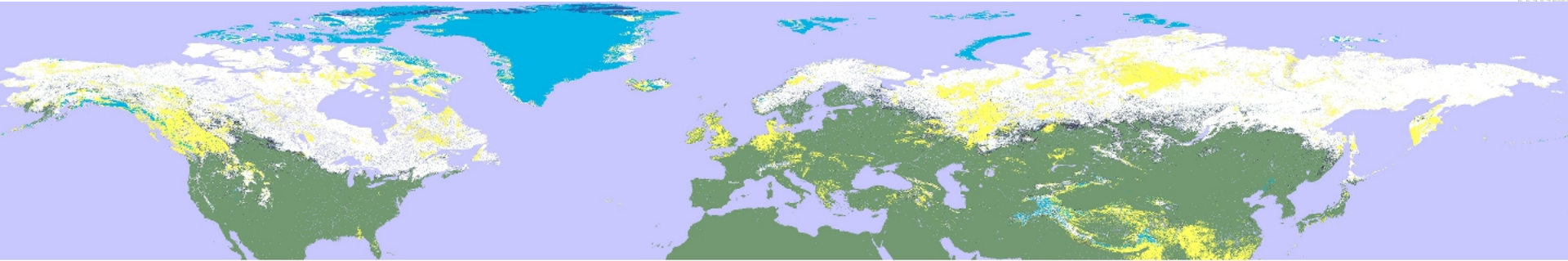
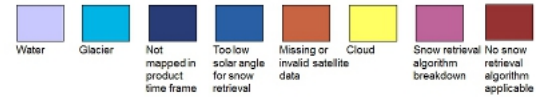


GlobSnow Snow Extent Product
Weekly Aggregated Fractional Snow
Cover (WFSC)
Version 2.0

Fractional Snow Cover (FSC) - Steps of 1% in product

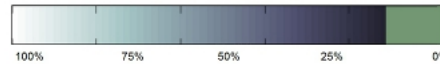


Layer-1 values when FSC is not retrieved

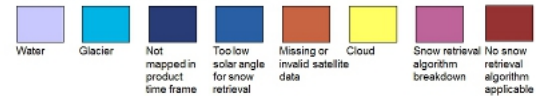


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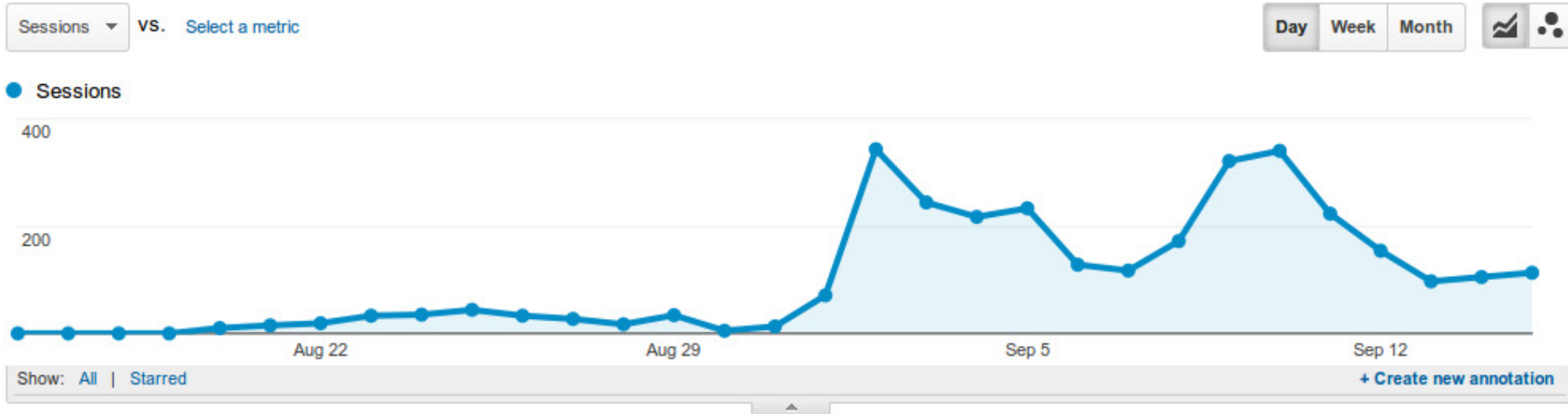
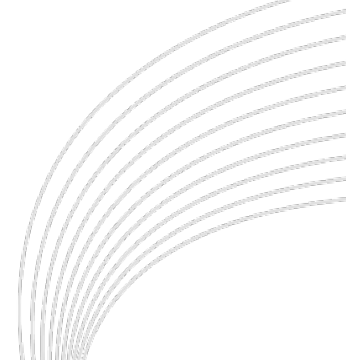
Layer-1 values when FSC is not retrieved





New SAMPO service

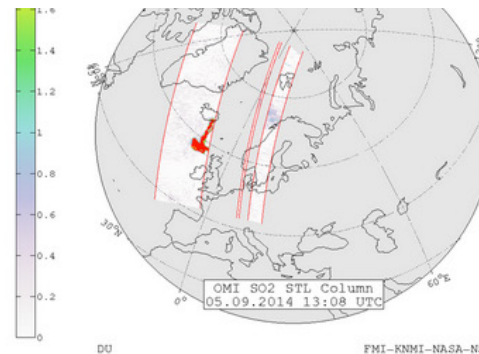
Satellite Measurements from Polar Orbit



and OMPS

OMPS

- Ozone Mapping and Profiler Suite
- On-board S-NPP
- Launched Oct 28th 2011



OMI SO2 5.9.2014

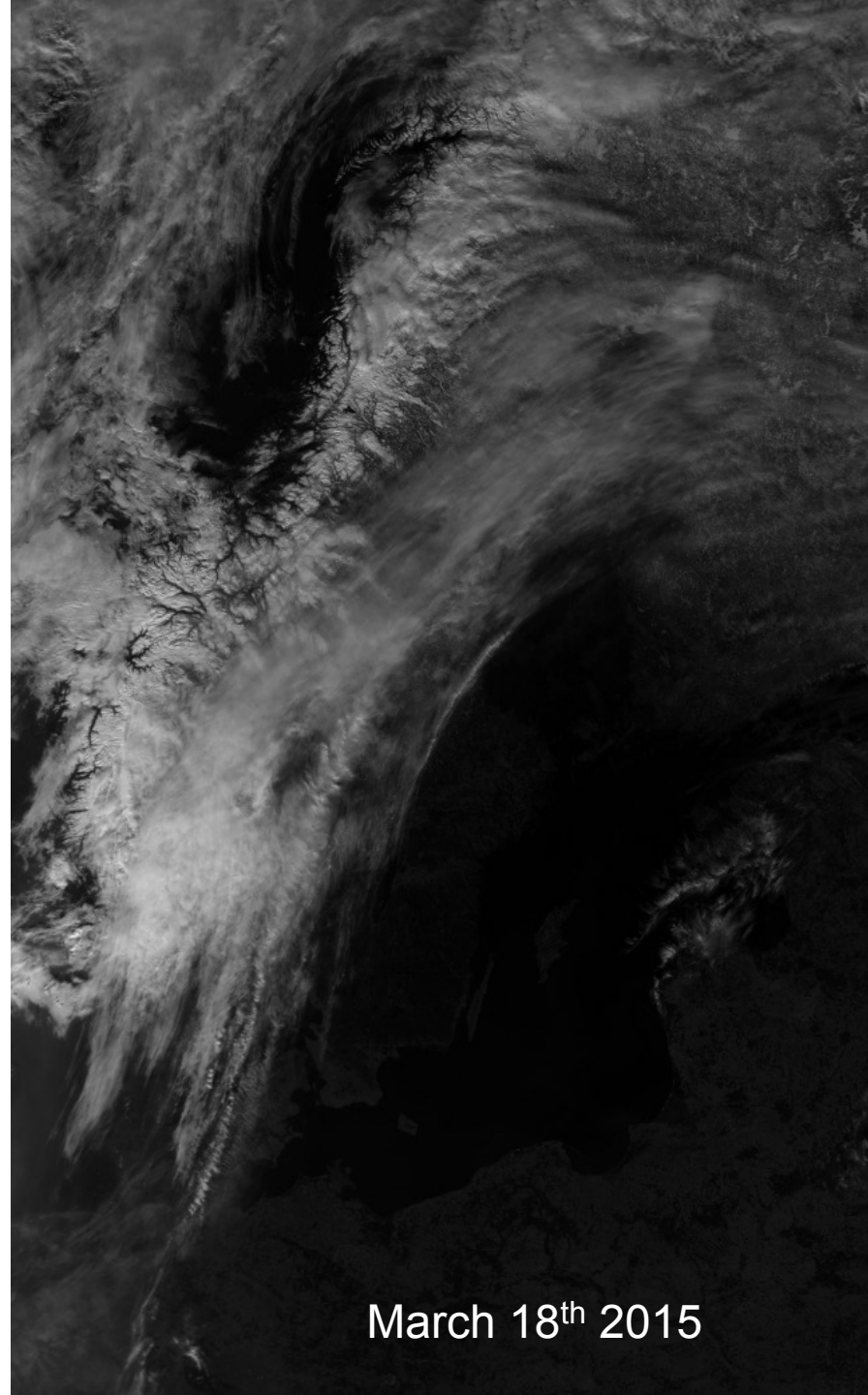


OMPS SO2 5.9.2014



Fengyun 3

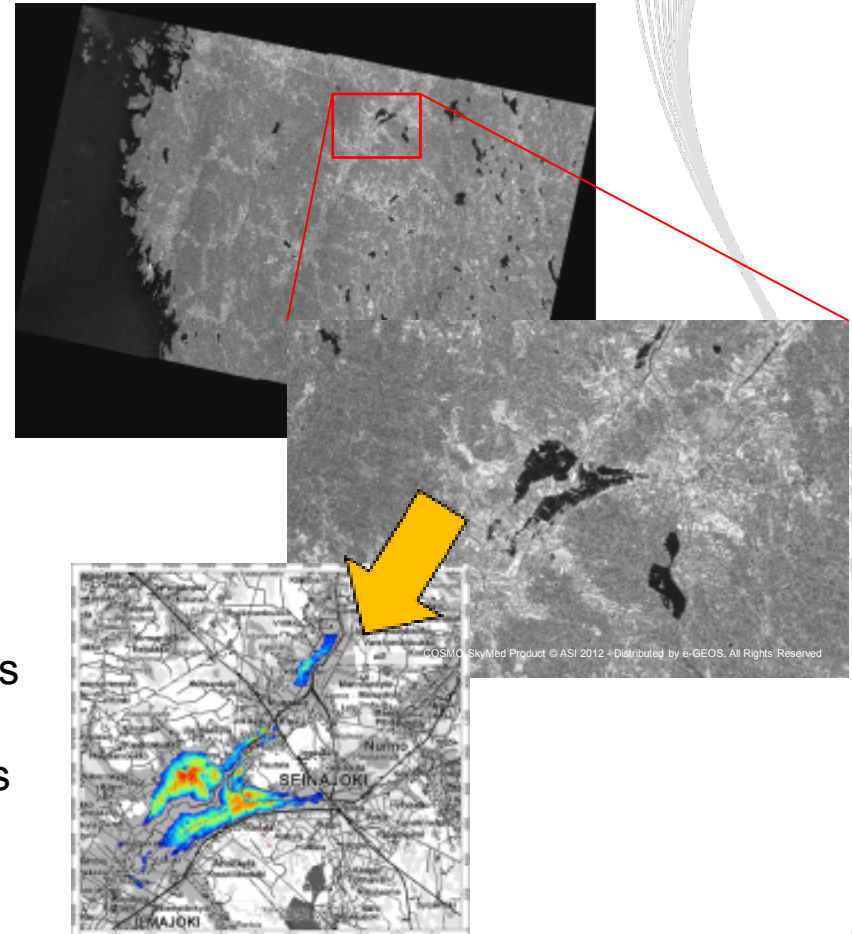
- Only MERSI data is transmitted in X-band
- Processor for 3B and 3C installed on February by KSPT
- L1 visualization with Pytroll
- For ice and water quality monitoring
- 3C oneline elements seem to not update often enough



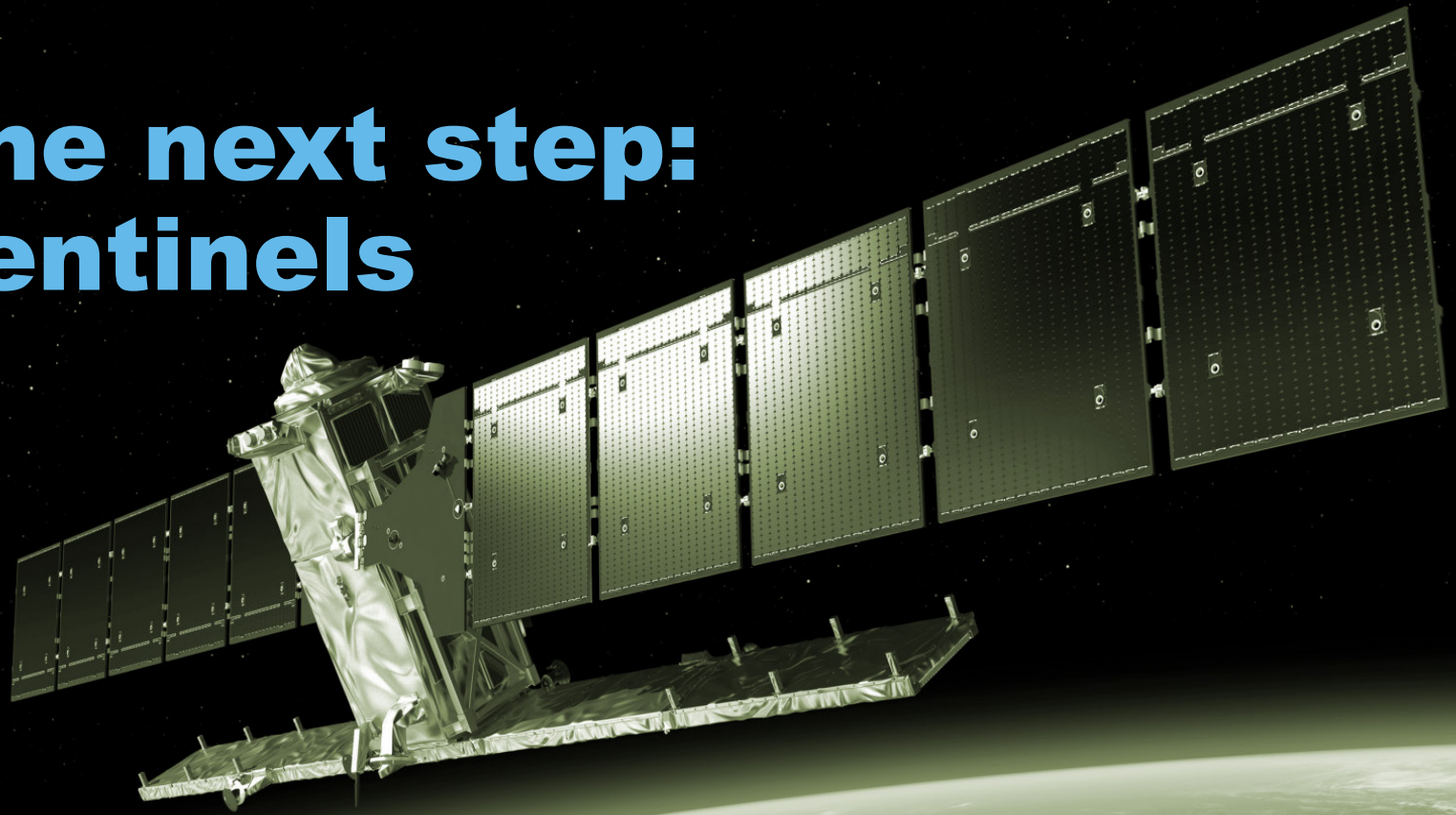


Flood extent products

- COSMO-SkyMed (SAR)
 - 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 utilizing high-res DEM
 - Generation of map products for authorities and public



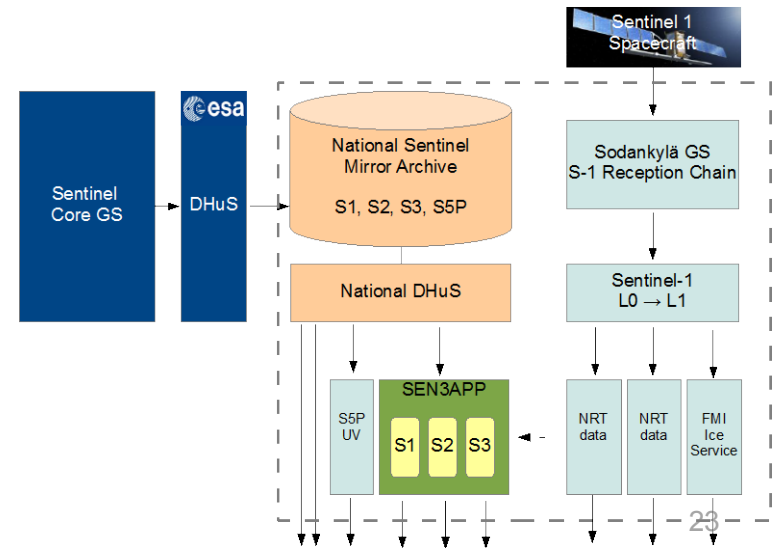
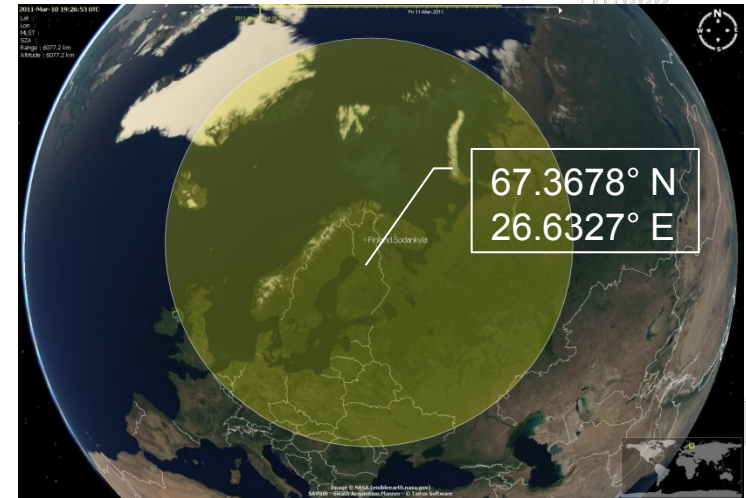
The next step: Sentinels





Finnish Collaborative Ground Segment

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 Data users
 - S1, S2, S3 and S5P
 - Medium-term data archive
 - Automated data processing lines for specific products
 - Hosting of processing services



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