The EUMETSAT Network of Satellite Application Facilities

NWC SAF

Support to Nowcasting and Very Short Range Forecasting

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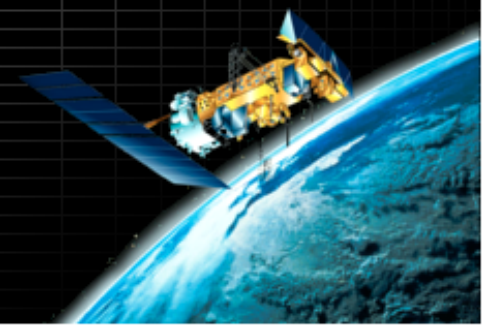
Nowcasting products from polar orbits

Adam Dybbroe



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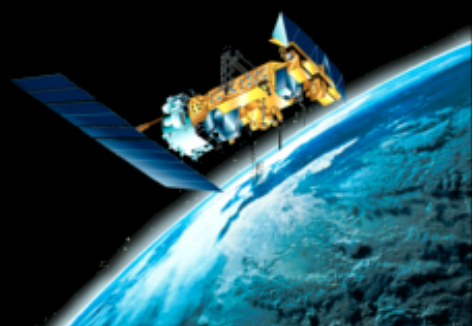
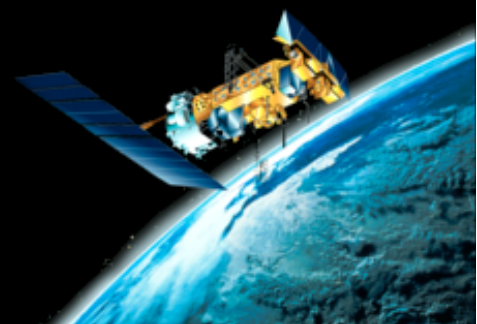
Outline

- What is PPS
- What is new in PPS
- VIIRS
- Use in Nowcasting
- Future



What is PPS?

- Processing package for cloud and precipitation products, developed by the NWCSAF
- Originally designed for local processing of Direct Readout data from AVHRR
- Adapted to other input formats, as for example AVHRR GAC



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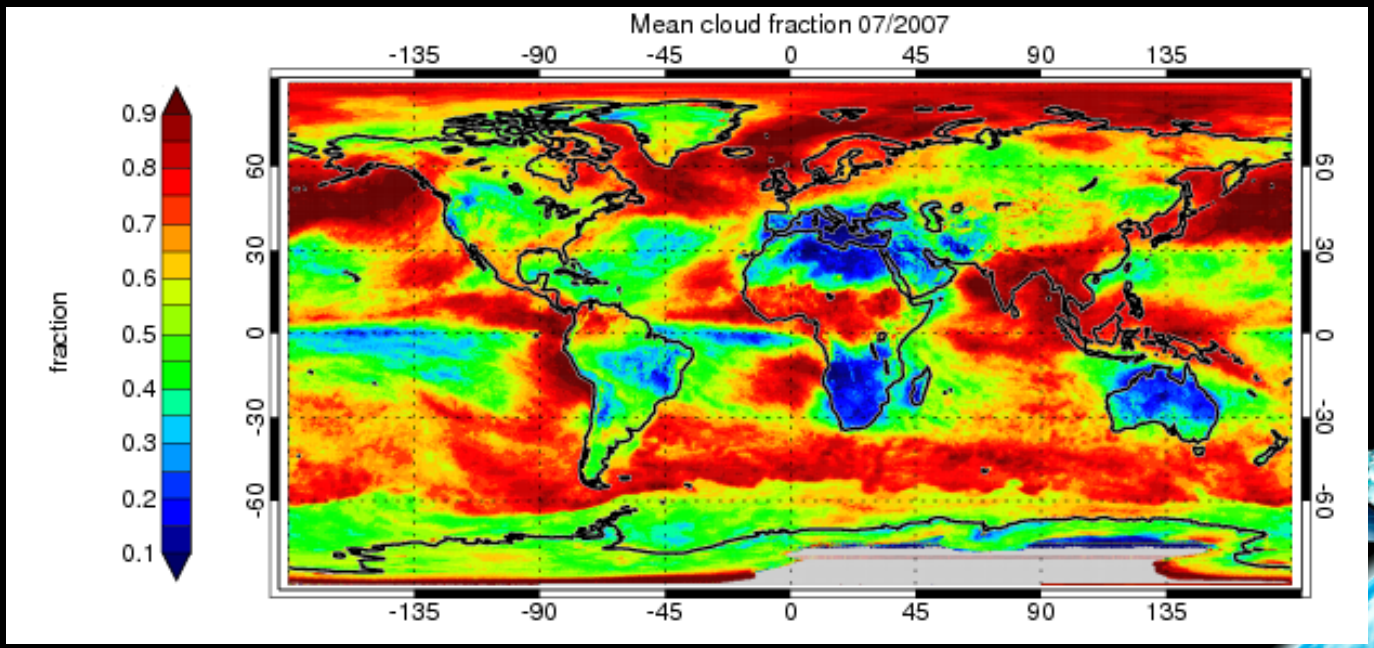
What is PPS?

- Used not only for Nowcasting, but also by CMSAF (global products), OSI SAF and Land SAF (regional products)

Mean cloud fractional coverage for July 2007, derived from NOAA 15, 16, 17 and 18:



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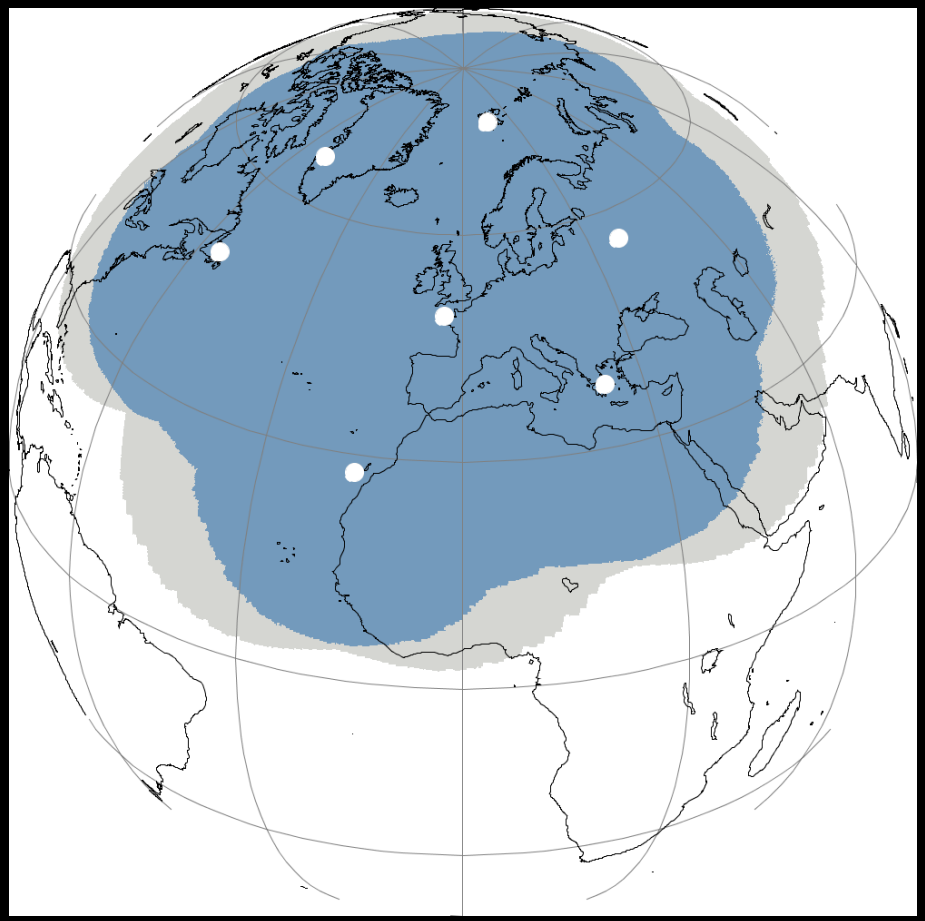
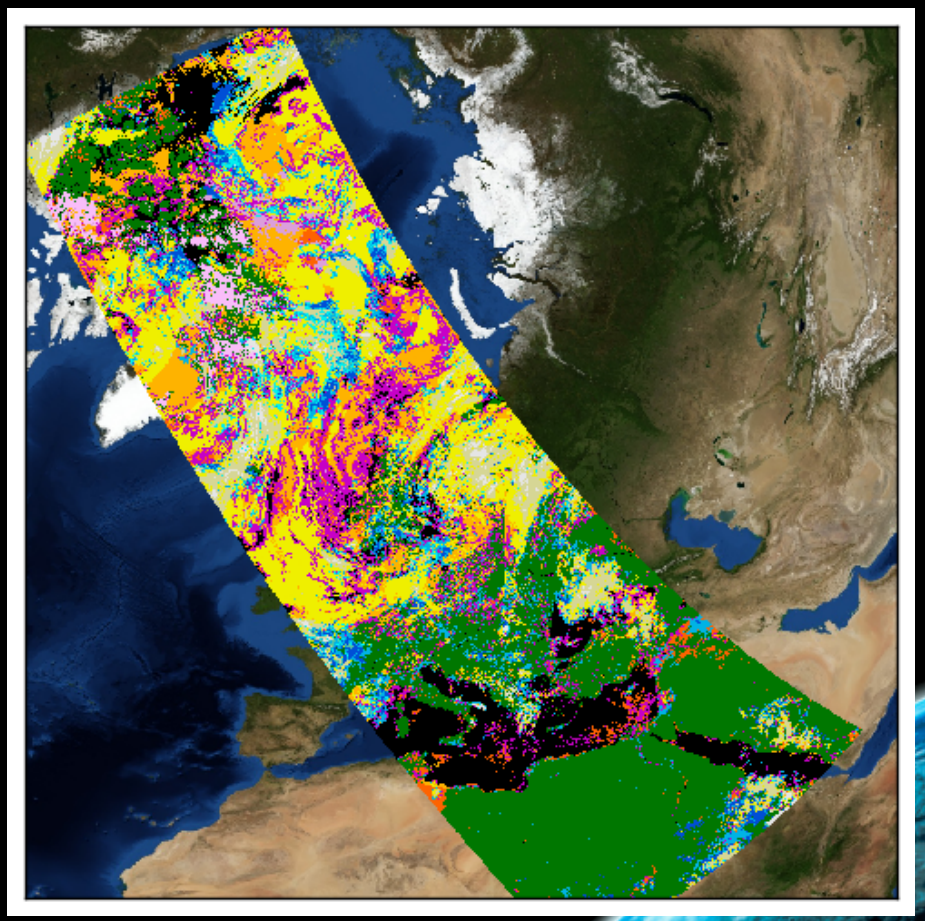
What is PPS?

- Will be used for processing cloud products in the upcoming EARS-NWC service





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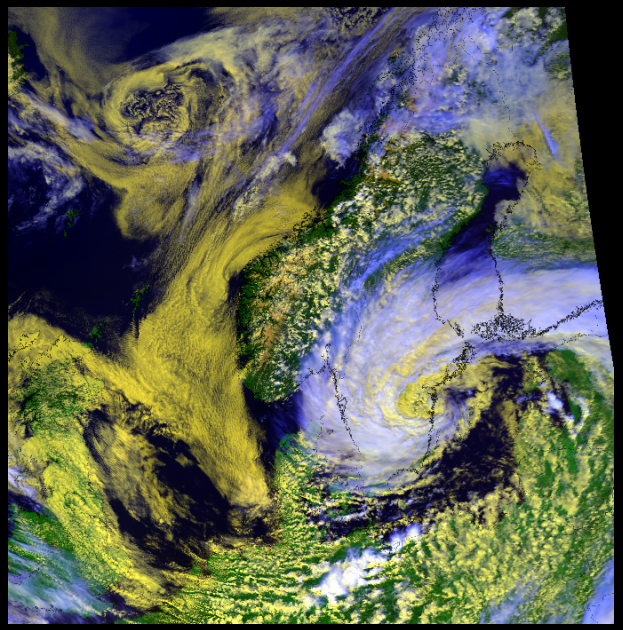
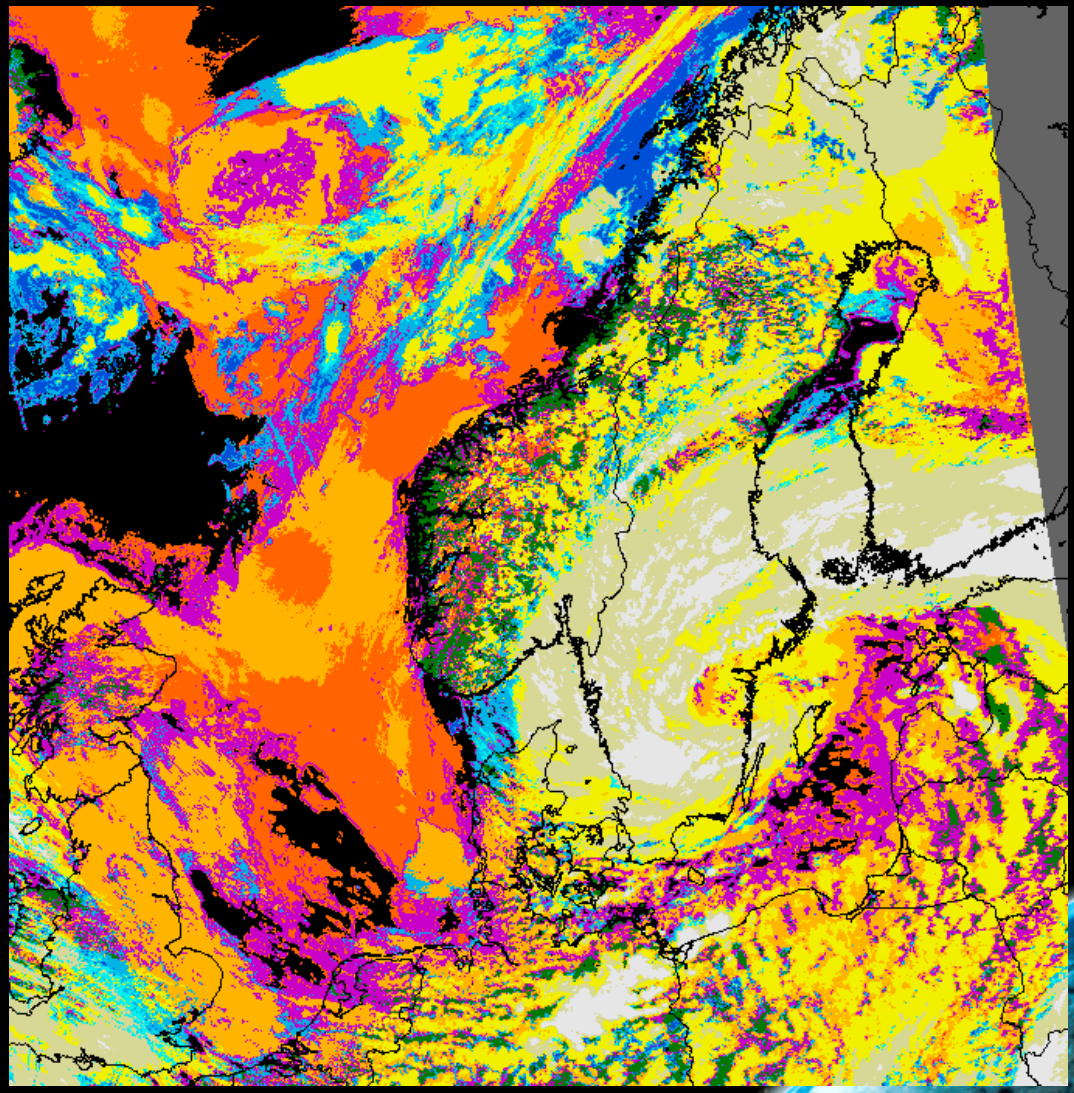
Cloud Mask & Type

NOAA 19 2012-06-25 12:22 UTC



Cloud free	Very high
Cloud free	Very thin cirrus
Snow	Thin cirrus
Snow/Ice	Thick cirrus
Very low	Cirrus above
Low	Fractional
Medium level	Unclassified
High	Unprocessed



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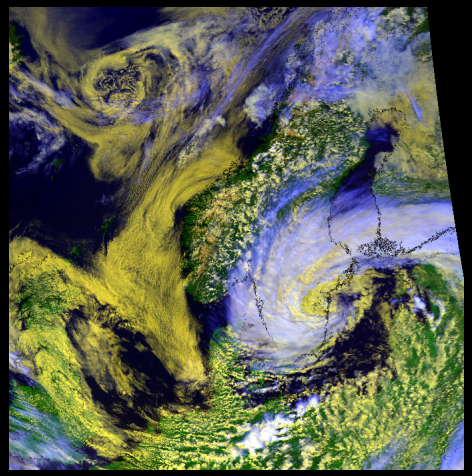
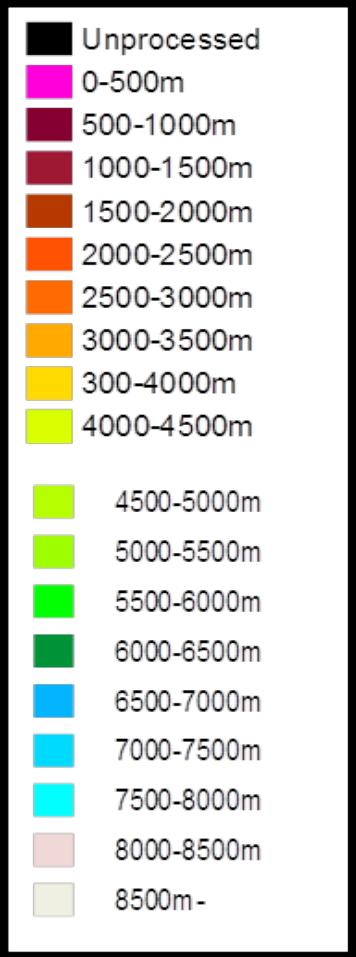
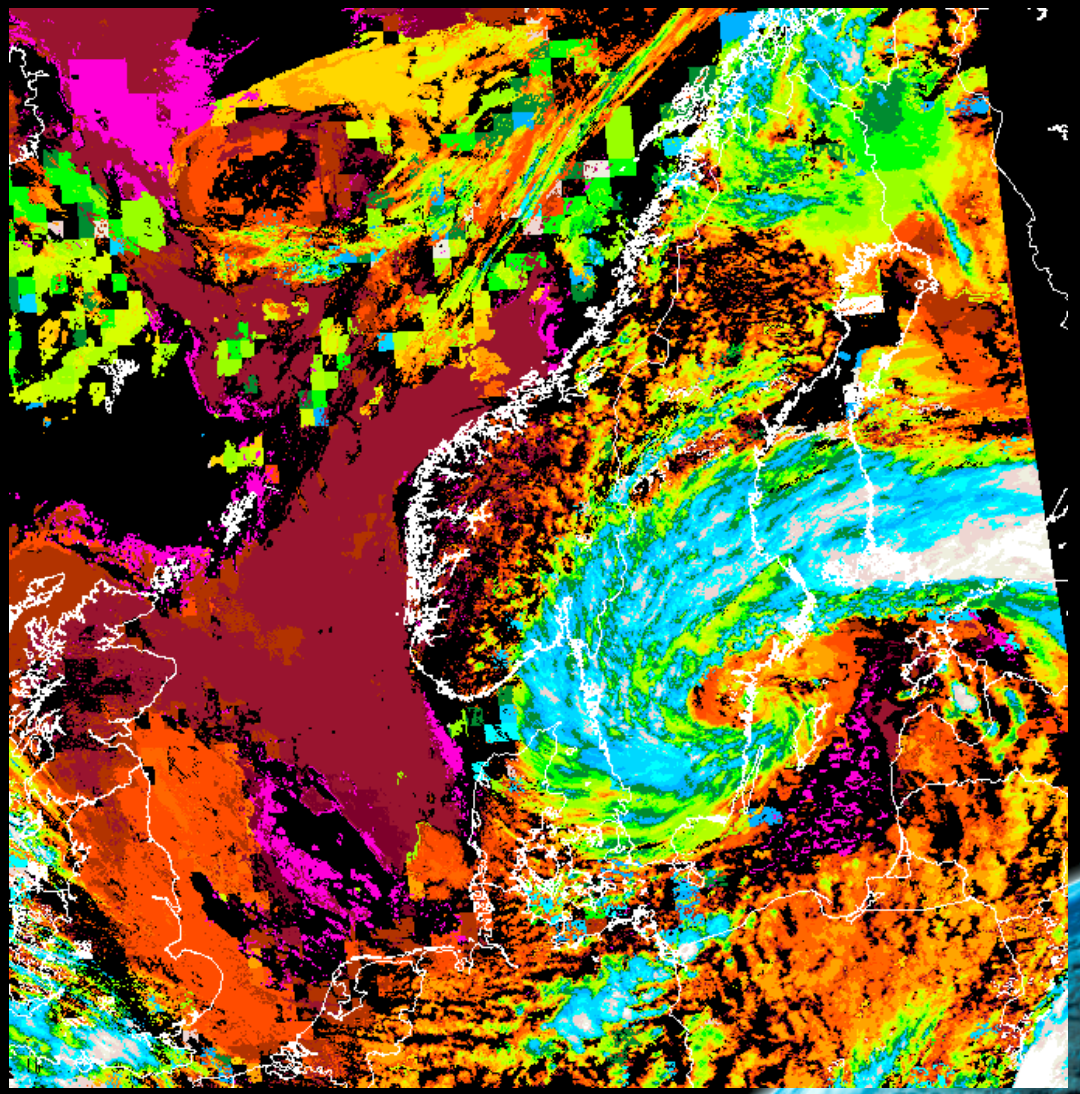
Cloud Top Temperature and Height

NOAA 19 2012-06-25 12:22 UTC







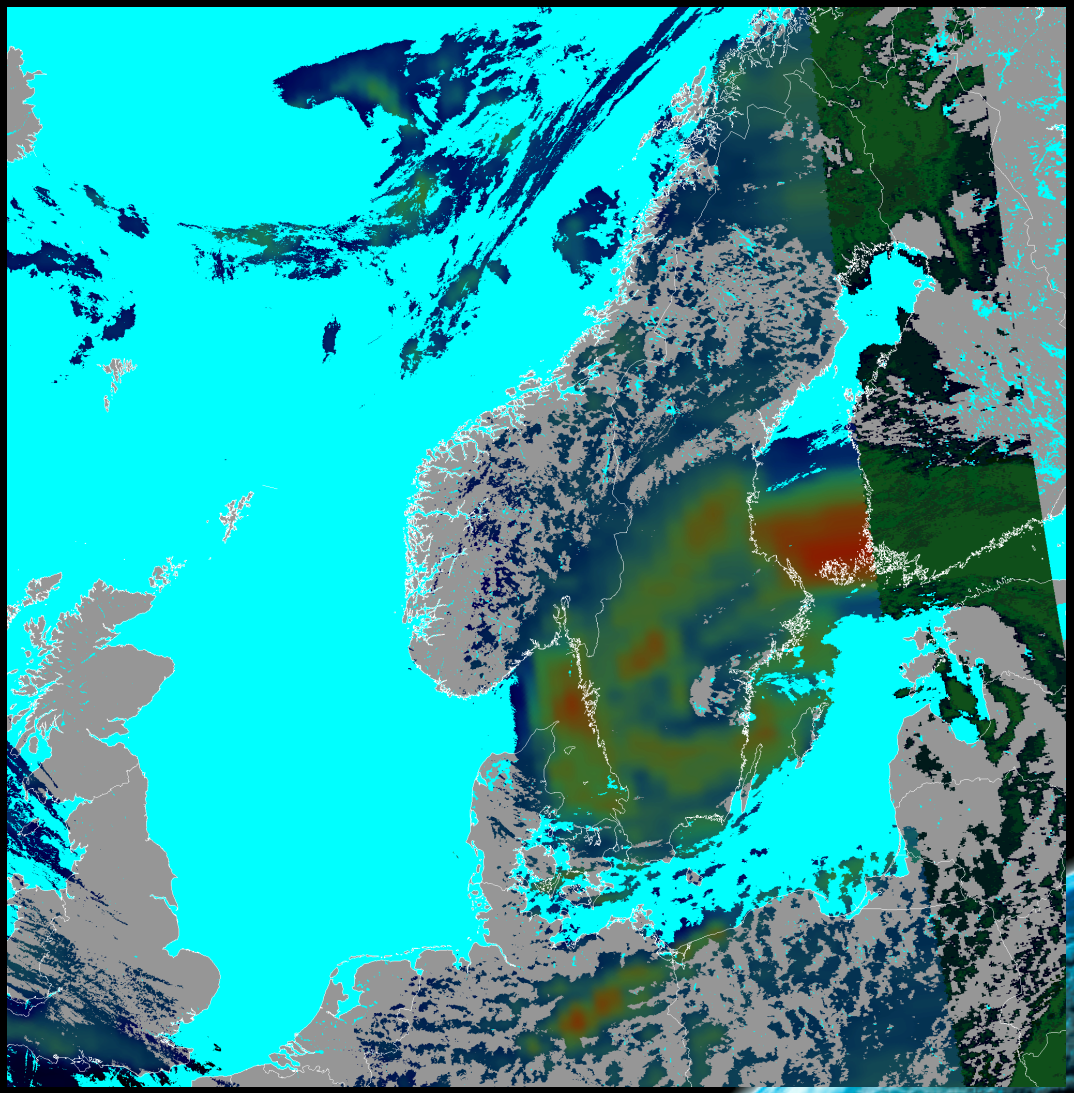
Precipitating Clouds

NOAA 19 2012-06-25 12:22 UTC

RGB of likelihood for precipitation in intensity classes

- Red: Intensive (> 5mm/hr)
- Green: light/mod (0.5-5 mm/hr)
- Blue: very light (0.1-0.5 mm/hr)

Based on MHS channel 1, 2 and 4 and AVHRR channel 4 & 5



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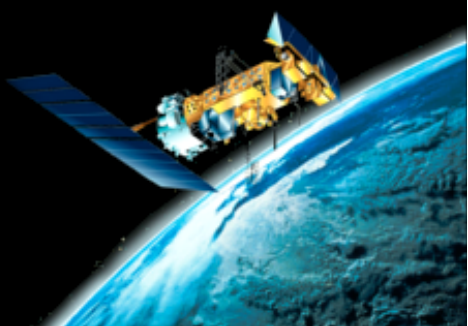
What's new in PPS? - v2012

Released May 2012

- Cloud Physical Properties – CPP
  - Developed by KNMI within the CMSAF
  - Adapted to PPS standards and level 2 validation
  - Framework for future cooperation and coordination
  - Released as NWCSAF software
- Support for VIIRS on Suomi NPP
- Substantial technical updates



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CPP – Cloud Physical Properties

Daytime only!

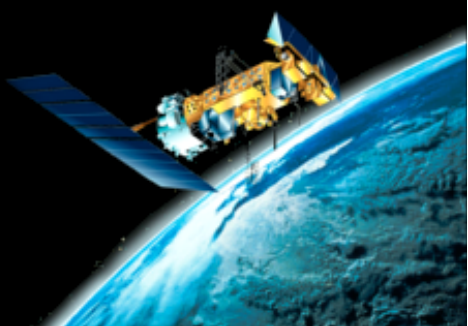
Parameters:

official

- Cloud Thermodynamic Phase – CPH
- Cloud Liquid Water Path – LWP

additional

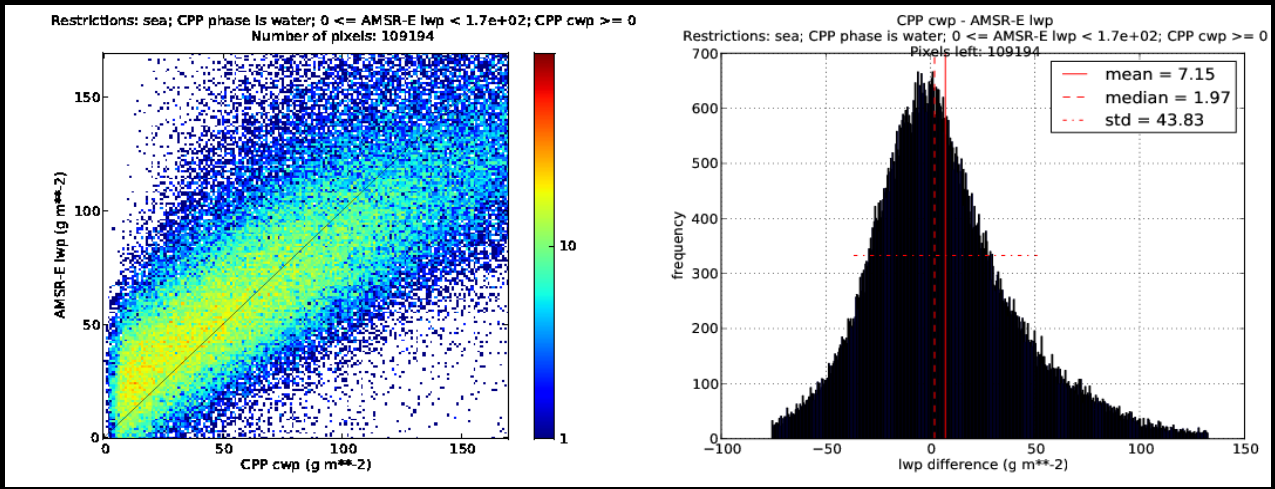
- Ice Water Path – IWP
- Effective Radius – reff
- Cloud Optical Thickness – COT



CPP Validation of LWP and Cloud Phase

performed against AMSR-E for lwp and Calipso for cph

LWP



LWP bias = 7g/m2

LWP RMS error = 44g/m2

Phase

	CALIOP liquid	CALIOP solid
CPP liquid	18327	5556
CPP solid	1693	9827

	POD	FAR
liquid	0.92	0.23
solid	0.64	0.15

Both liquid water over ocean and cloud phase perform well within specifications

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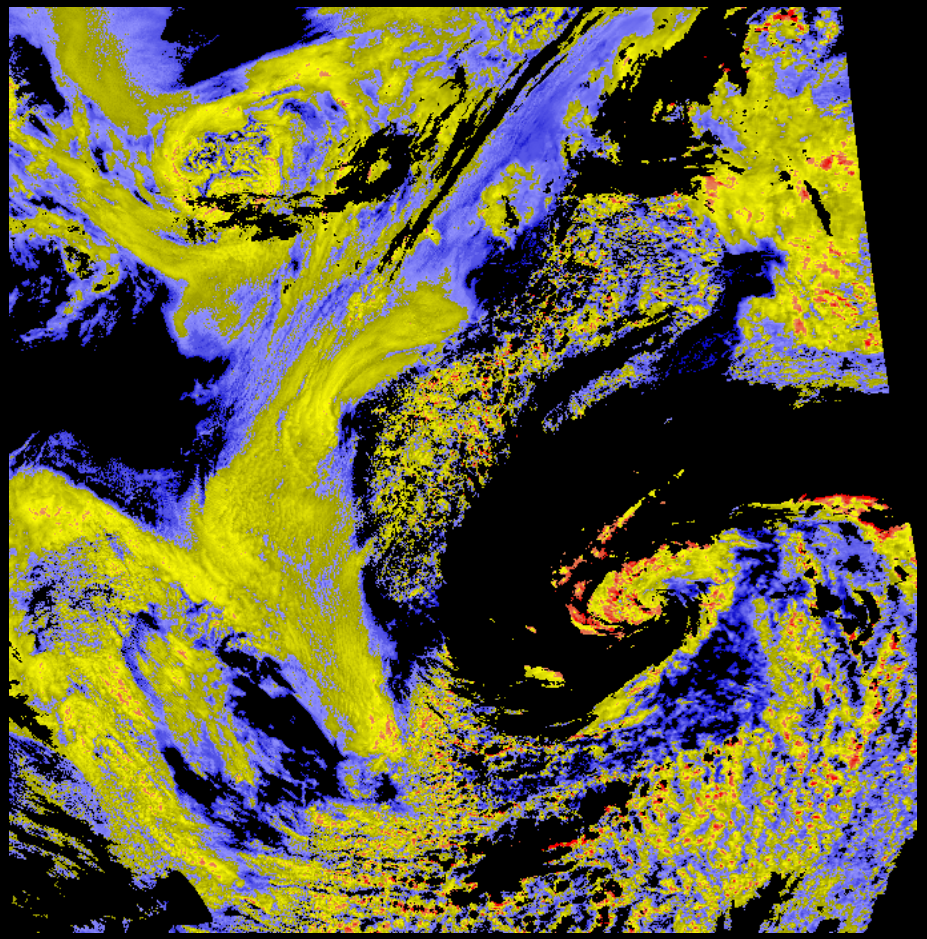
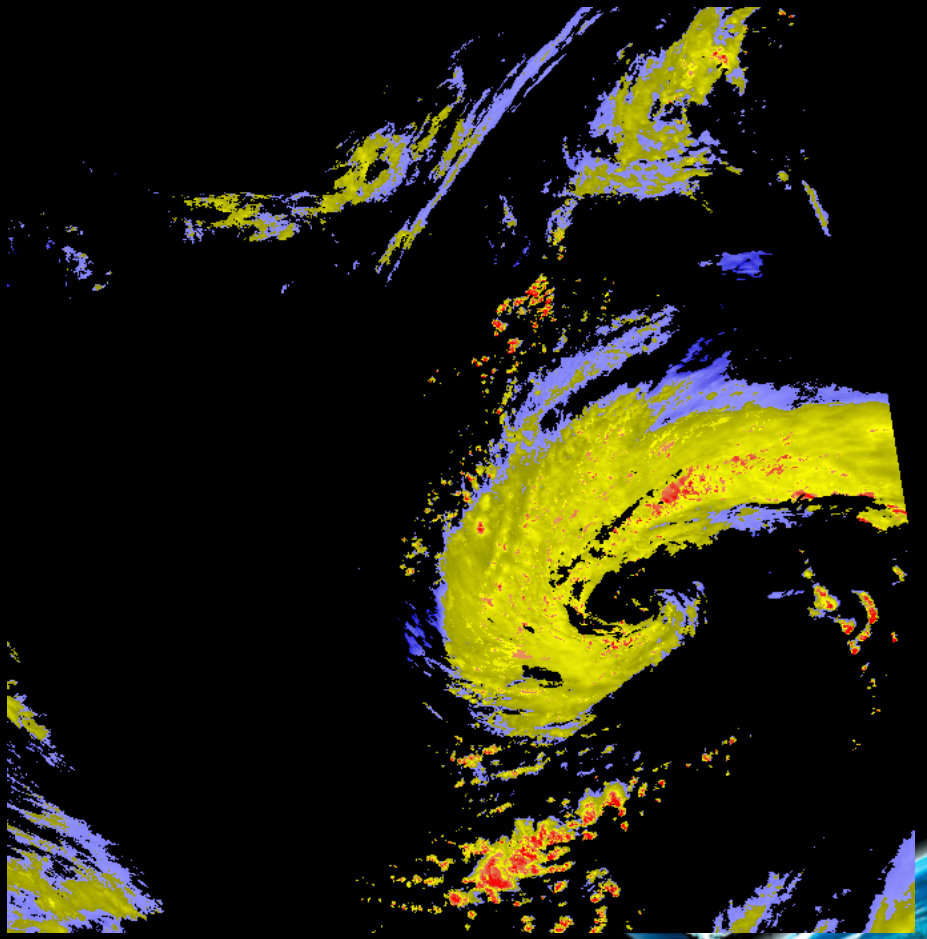
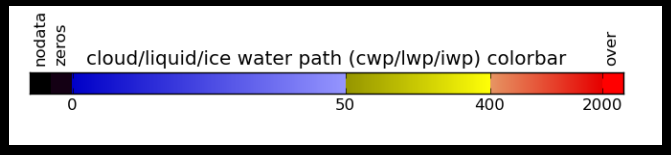
CPP products

LWP



IWP





Unit: g/m2

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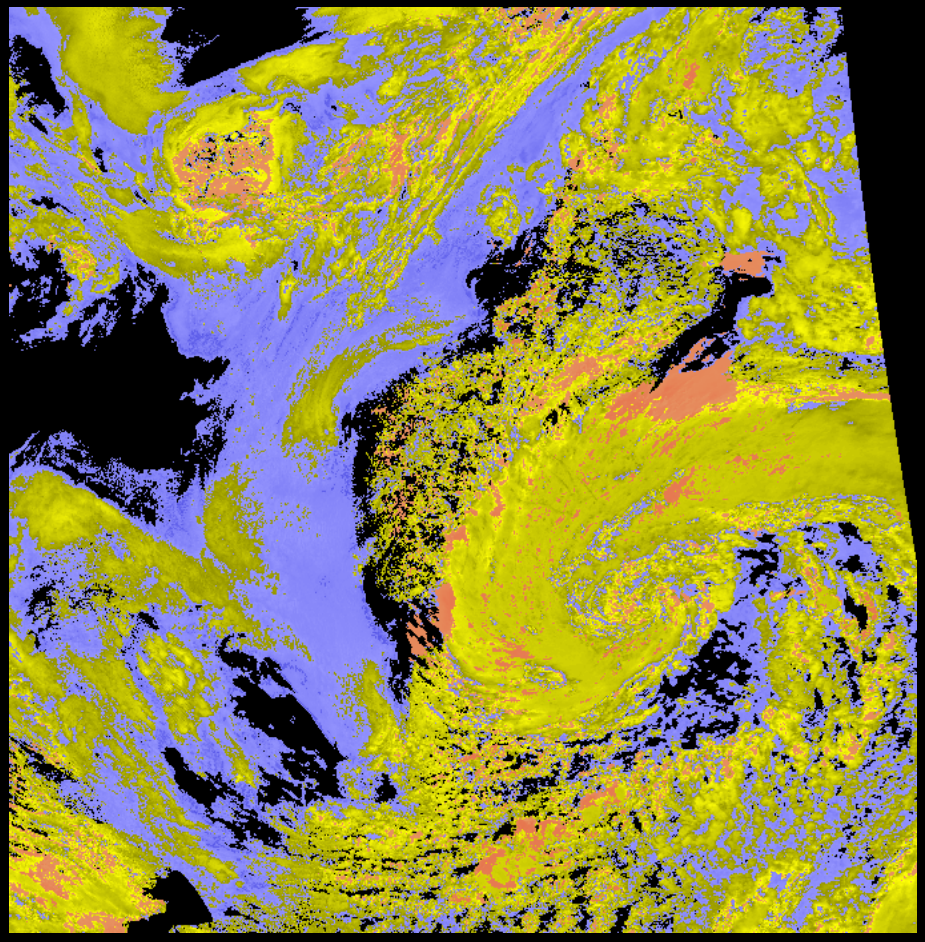
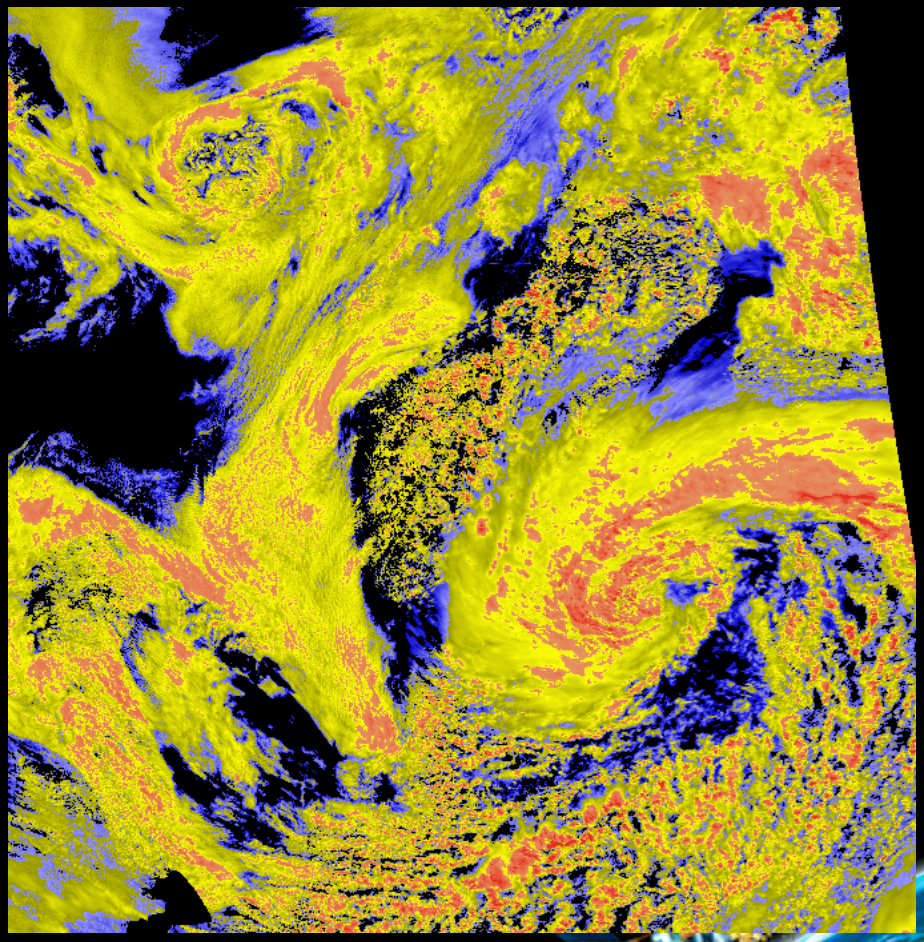
CPP products

Effective radius



Cloud Optical Thickness



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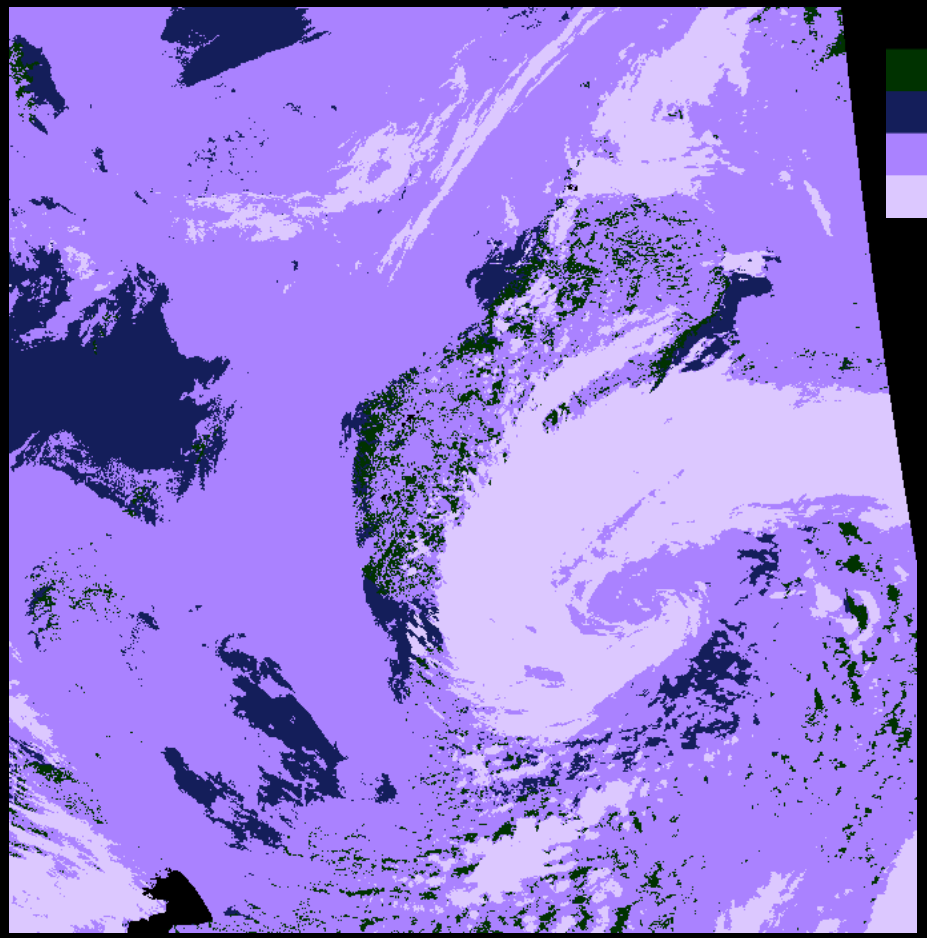
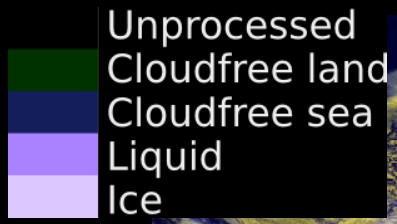
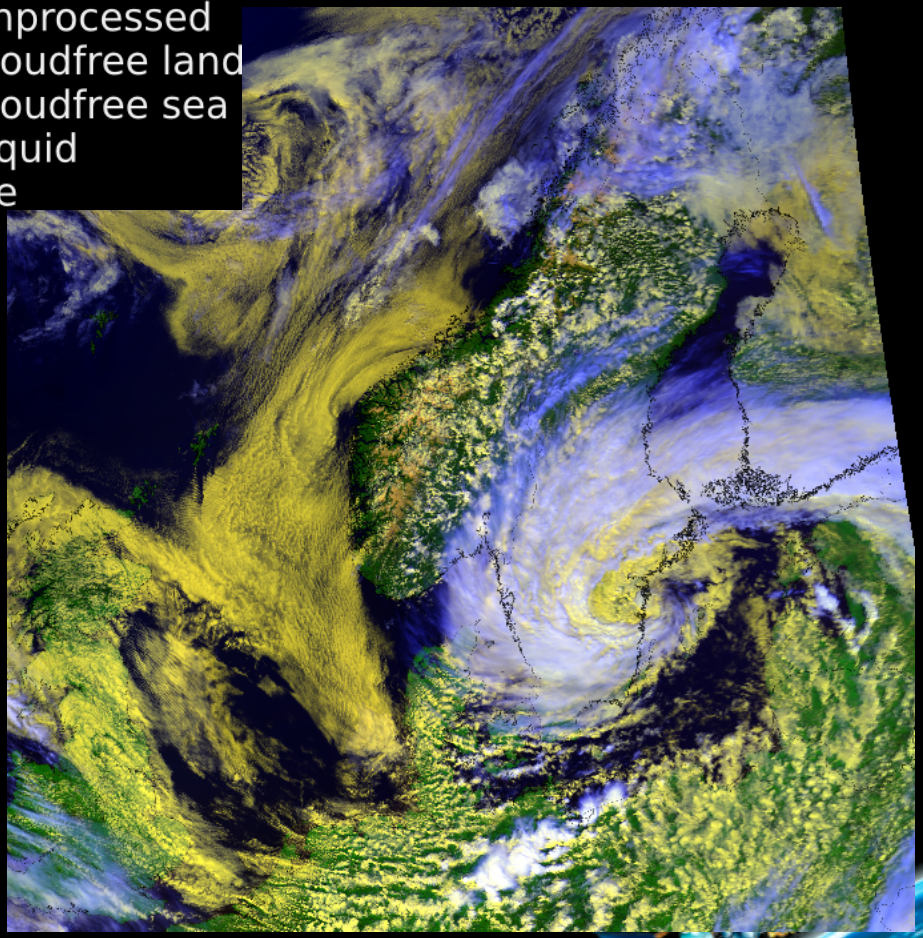
CPP products

Cloud Phase







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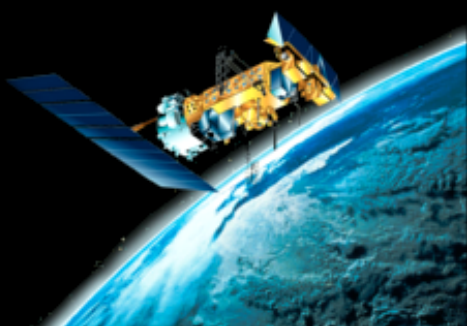
VIIRS on board Suomi NPP

- Launched October 28, 2011
- AVHRR-MODIS-OLS heritage
- 22 spectral bands
  - 16 moderate resolution bands at ~740 m
  - 5 high resolution imaging bands at ~370 m
  - One broad band visible day-night band (DNB)
- Wide swath: ~3000 km



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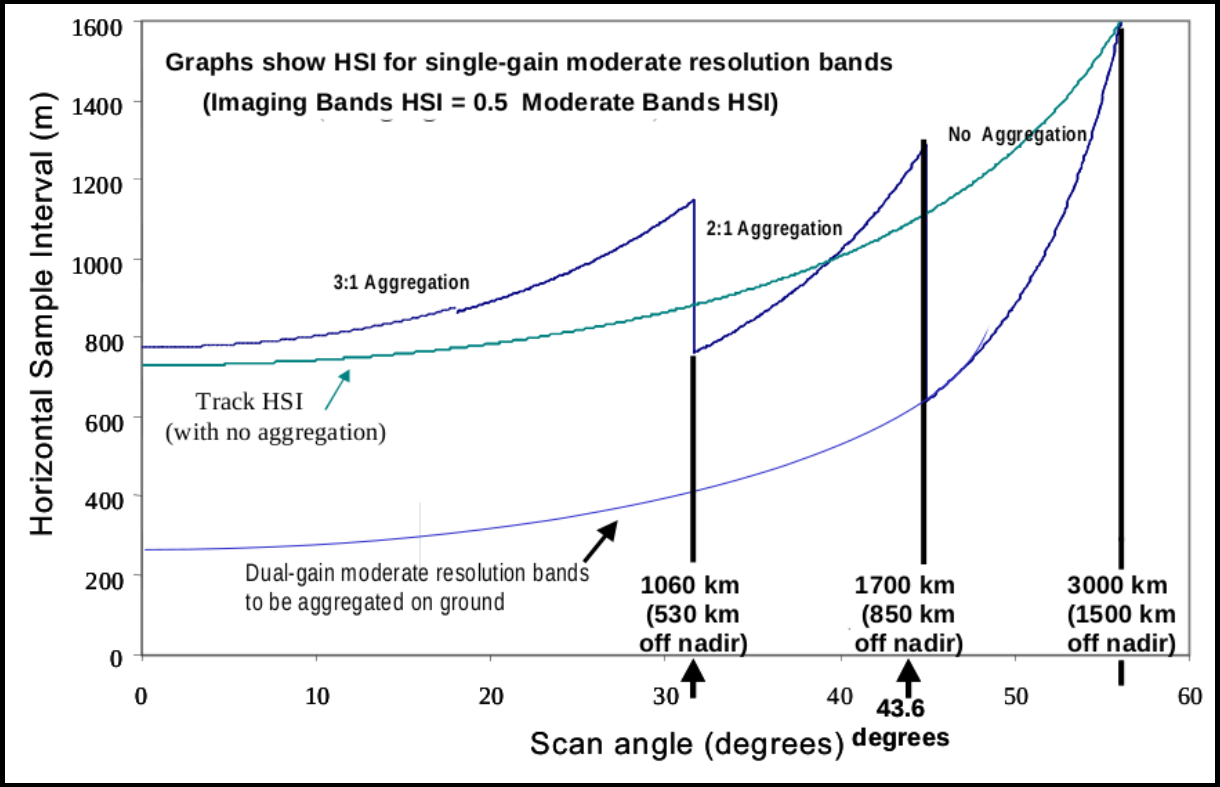
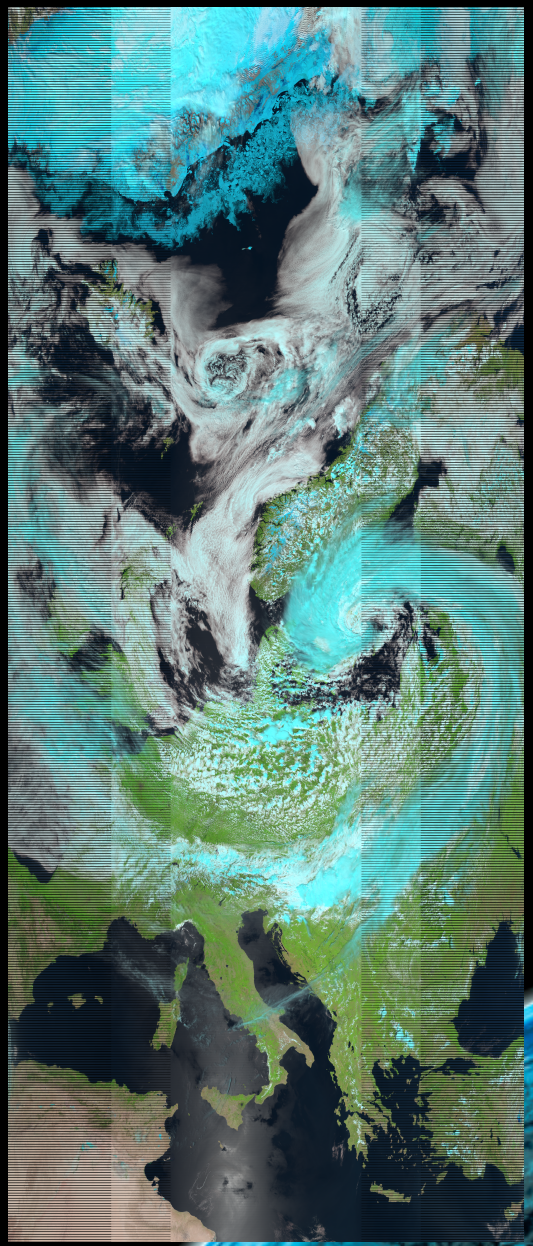
VIIRS

VIIRS M10, M7, M5: June 25 11:49 UTC, 2012
Processed with CSPP and pytroll (www.pytroll.org)

Quasi constant resolution through on-board aggregation and *bow-tie* deletion





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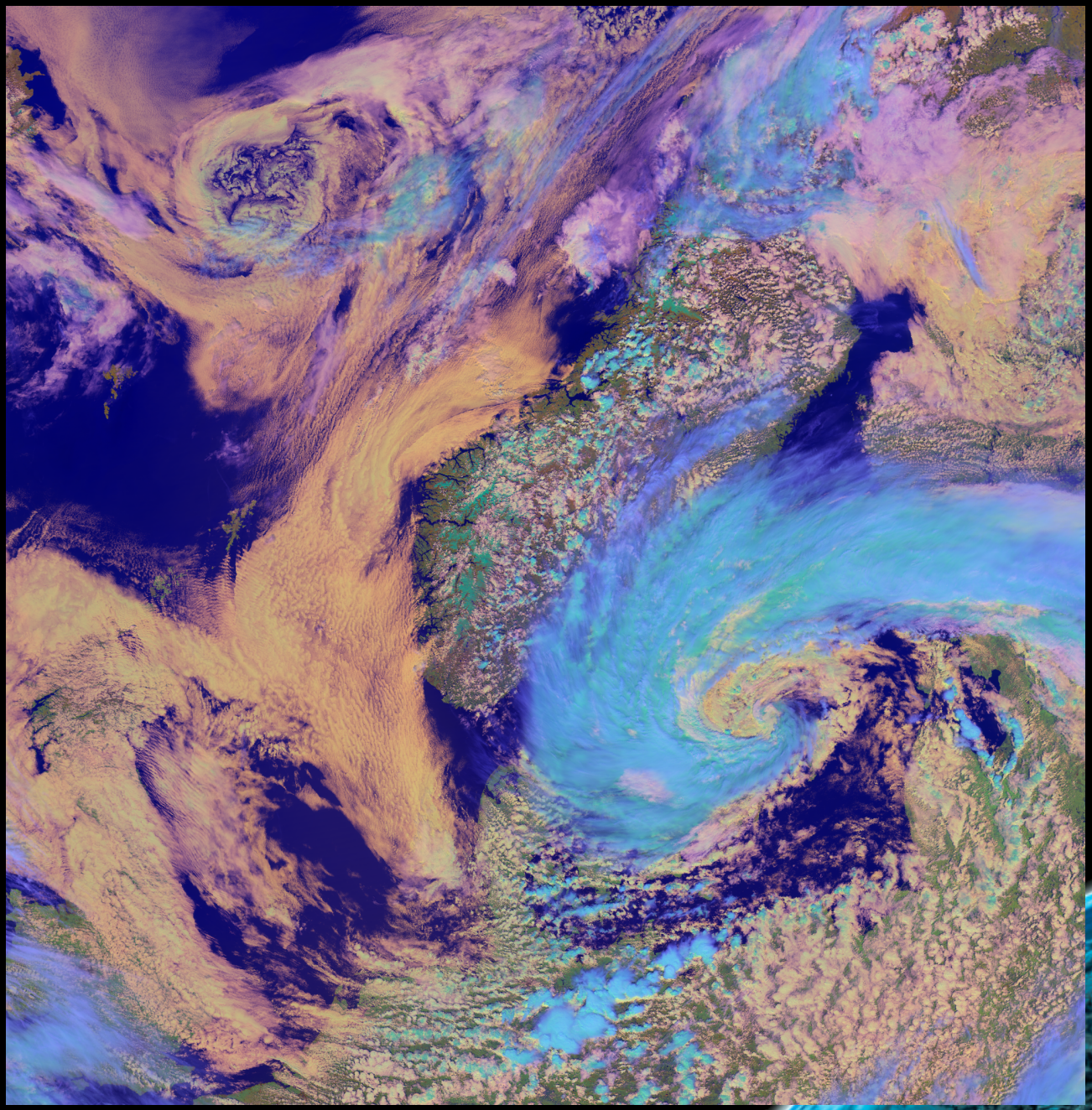
VIIRS

RGB (M10, M7, M15):

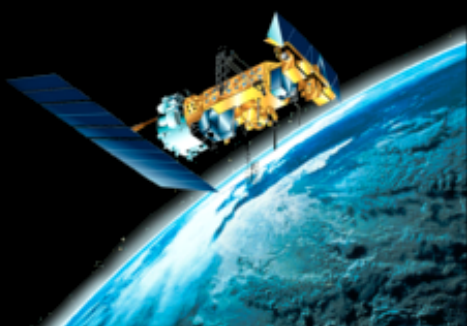
June 25 11:49 UTC, 2012

Processed with pytroll
(www.pytroll.org)



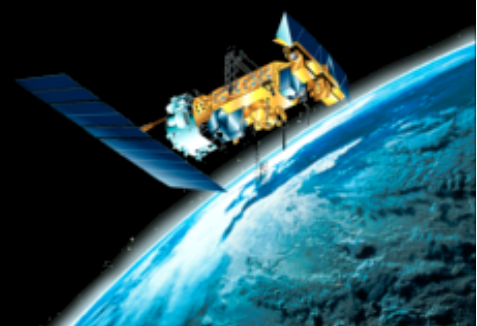
VIIRS in PPS

- All moderate resolution AVHRR heritage channels + 8.6 µm
- CSPP (NOAA) used to go from RDR to SDR (level1)
- No valid precipitation product until v2014



VIIRS in PPS

- VIIRS cloud products generally in good agreement with AVHRR (NPP & N19)
  - More ice phase and cirrus seem to be detected
- Validation activities started



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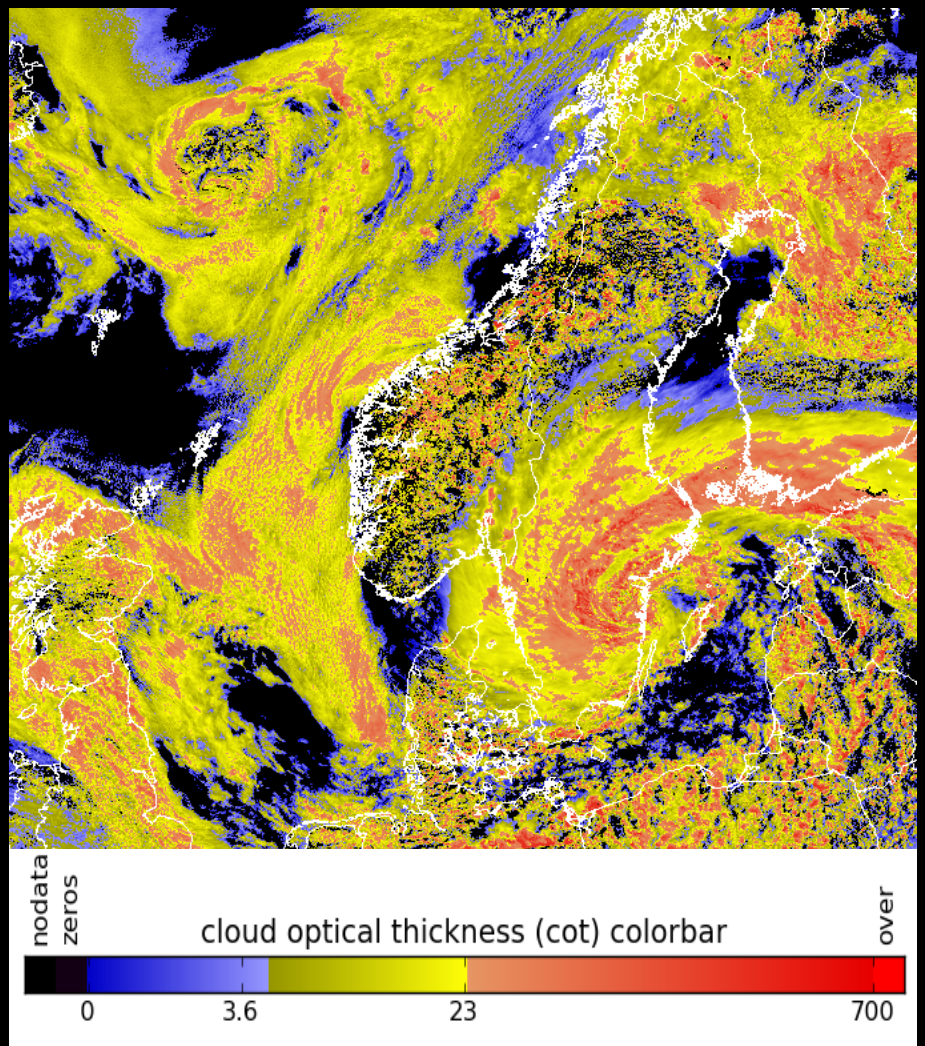
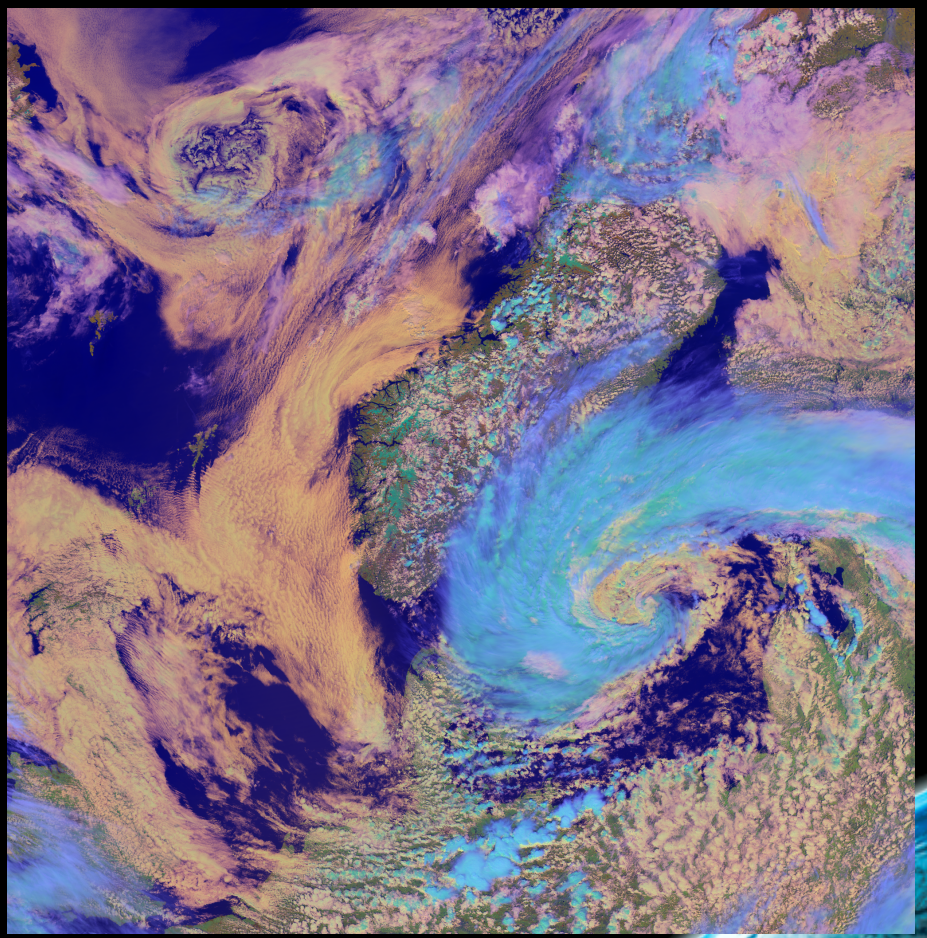
VIIRS products

Cloud Optical Thickness



VIIRS: June 25 11:49 UTC, 2012



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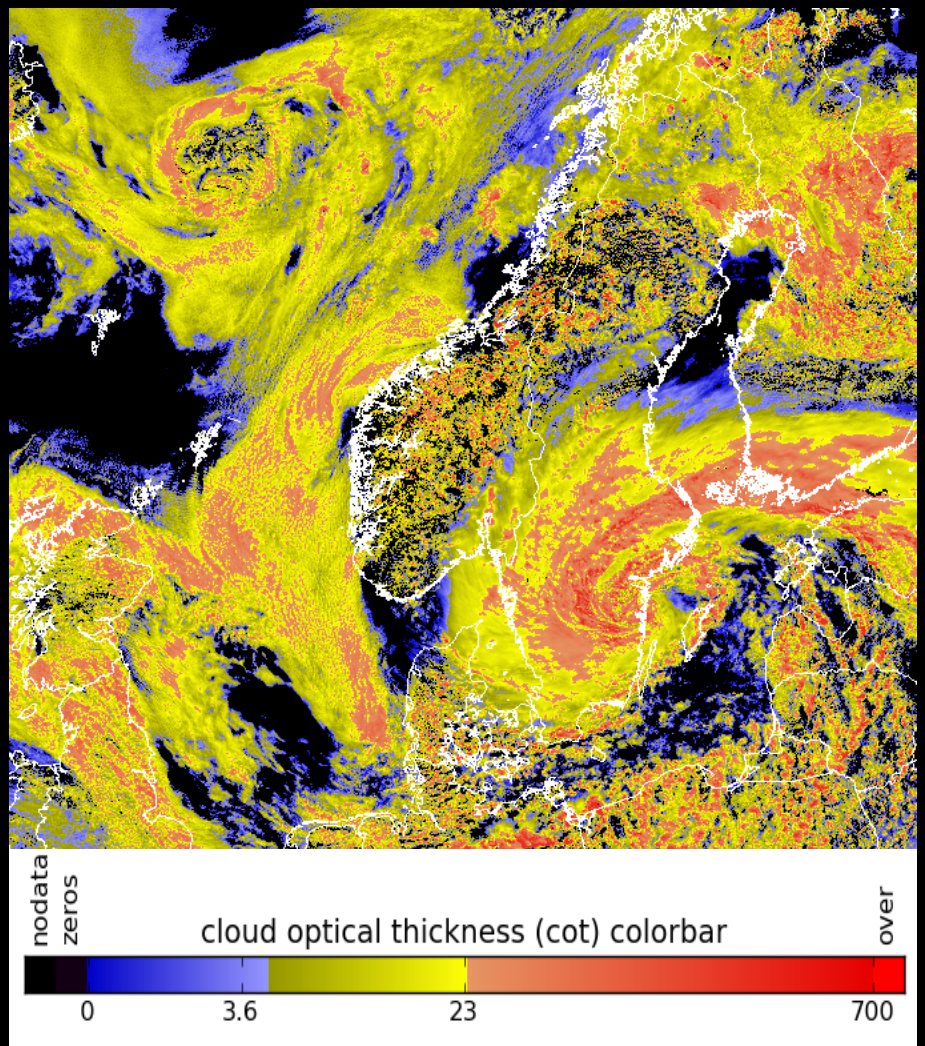
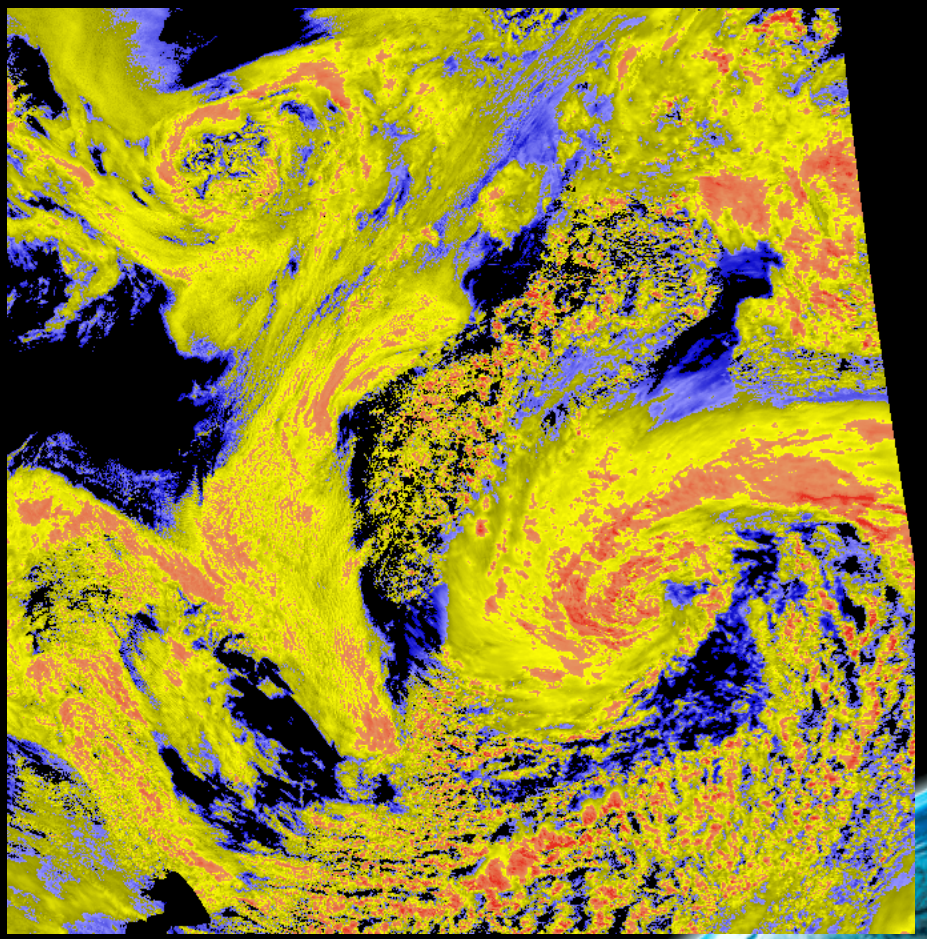
VIIRS versus AVHRR products

Cloud Optical Thickness

VIIRS: June 25 11:49 UTC, 2012



AVHRR: June 25 12:22 UTC, 2012



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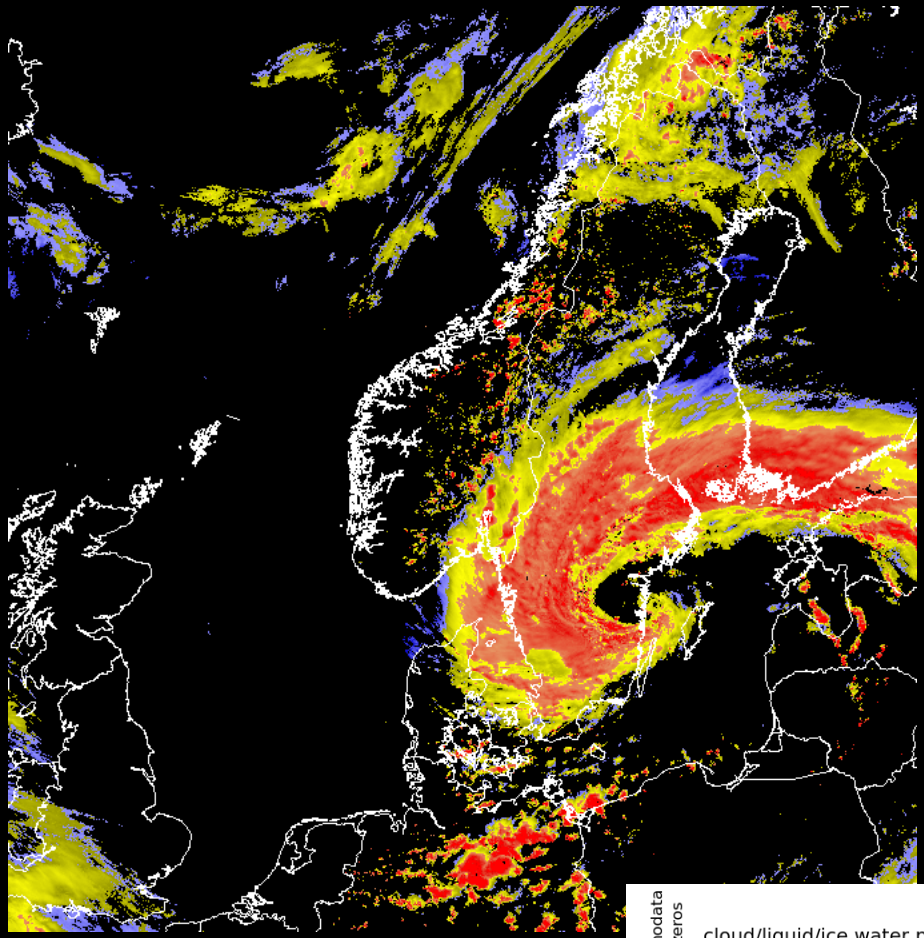
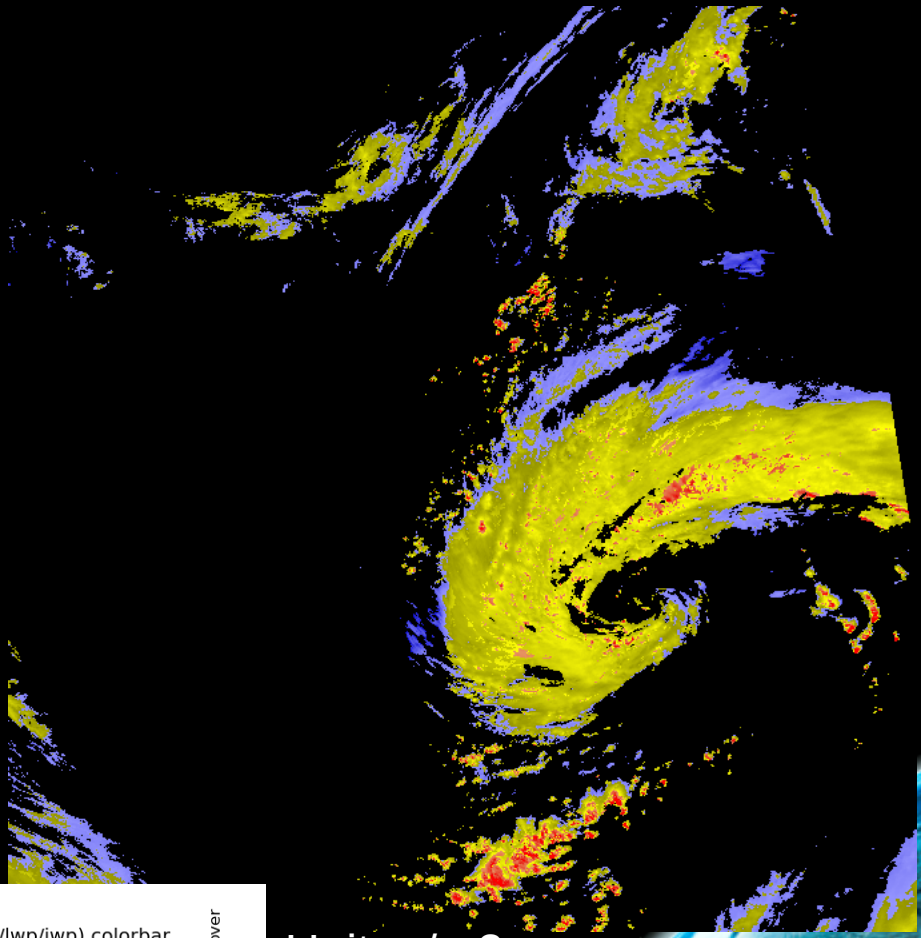
VIIRS versus AVHRR products

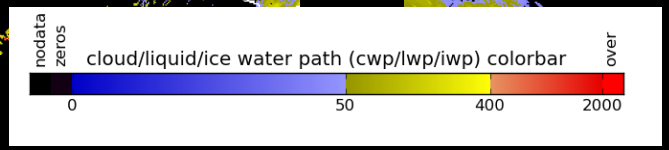
Ice Water Path

VIIRS: June 25 11:49 UTC, 2012

AVHRR: June 25 12:22 UTC, 2012





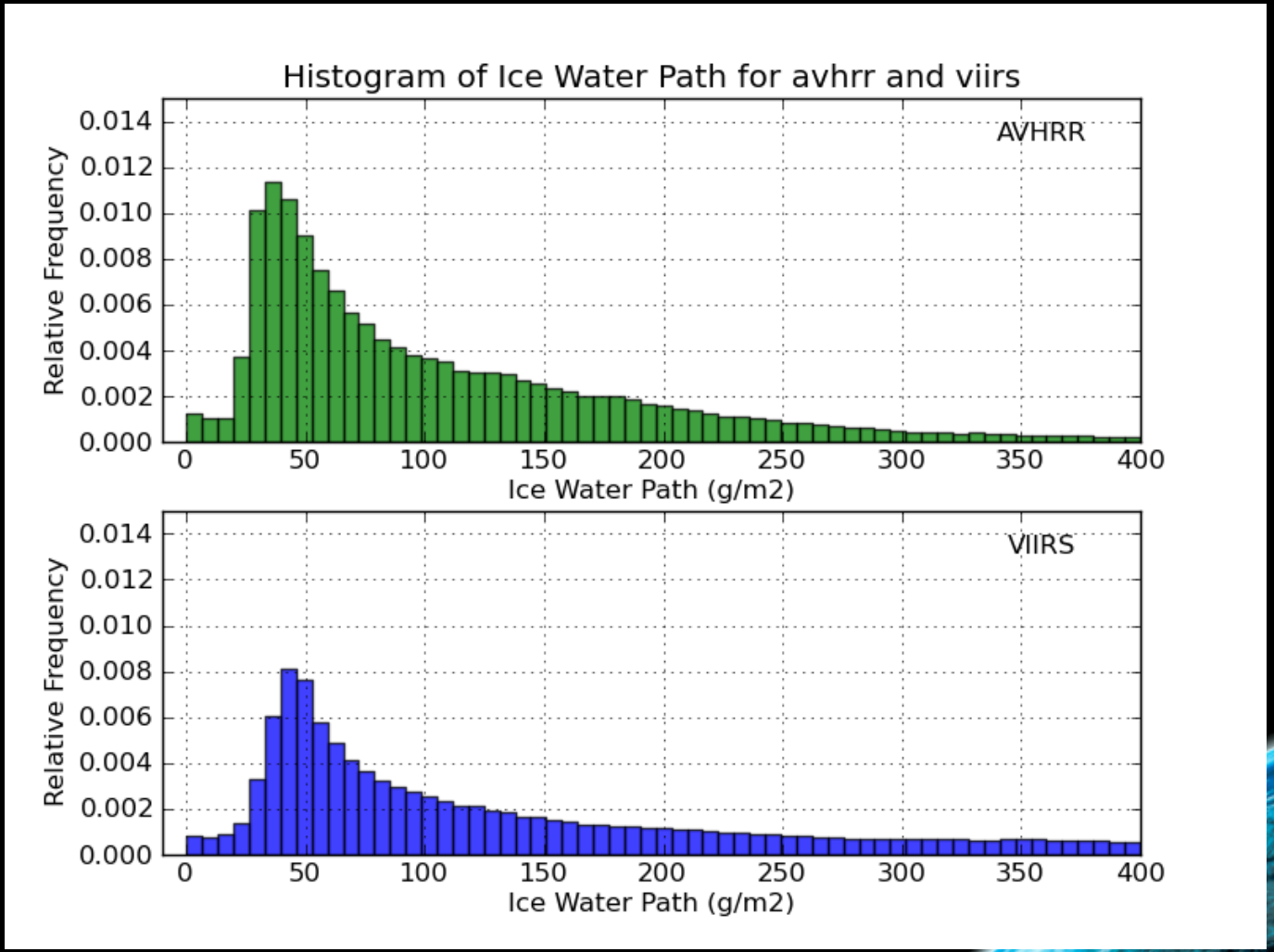


Unit: g/m2

VIIRS versus AVHRR products

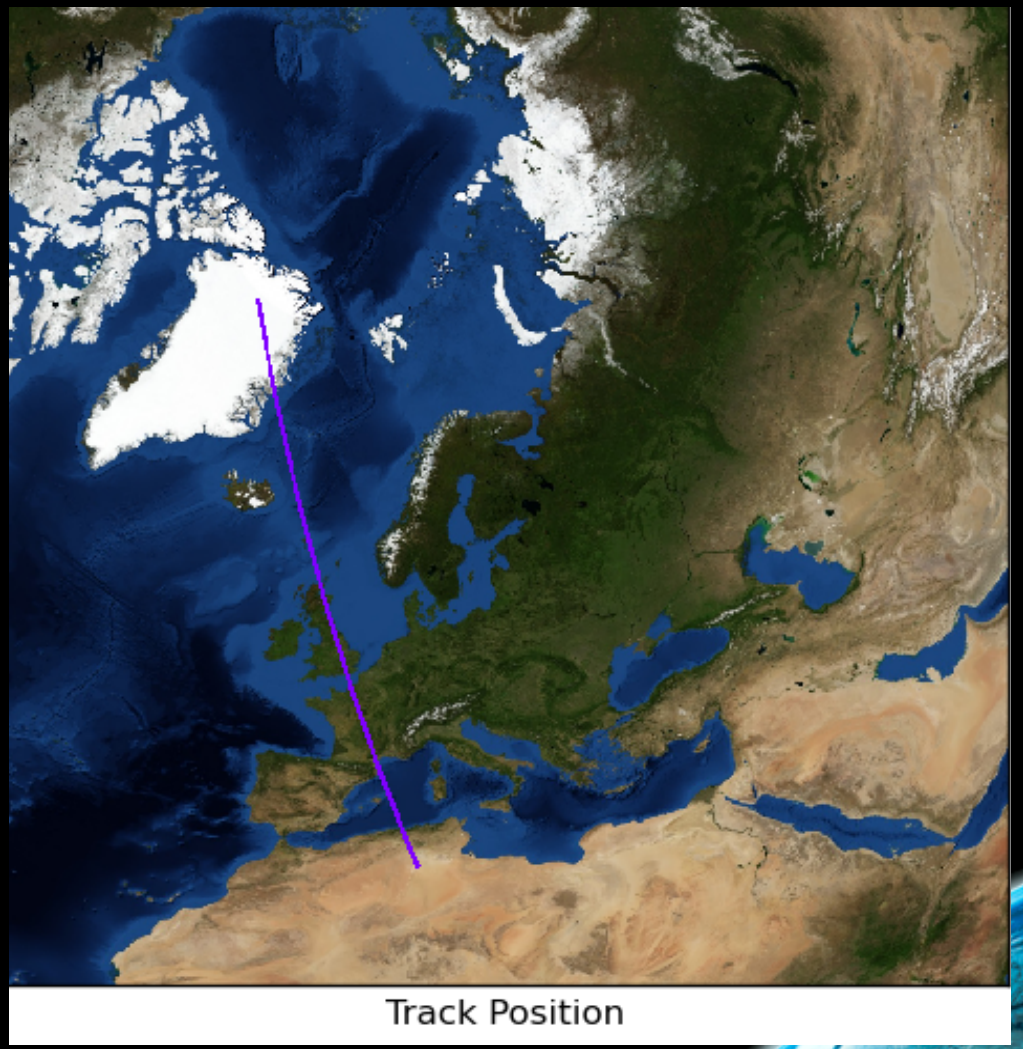
Ice Water Path:

Somewhat higher IWP values in VIIRS compared to AVHRR



VIIRS Cloud Top Height

Validation with Collocated Calipso/CALIOP observations



Suomi NPP scene:
June 11 12:53 UTC, 2012

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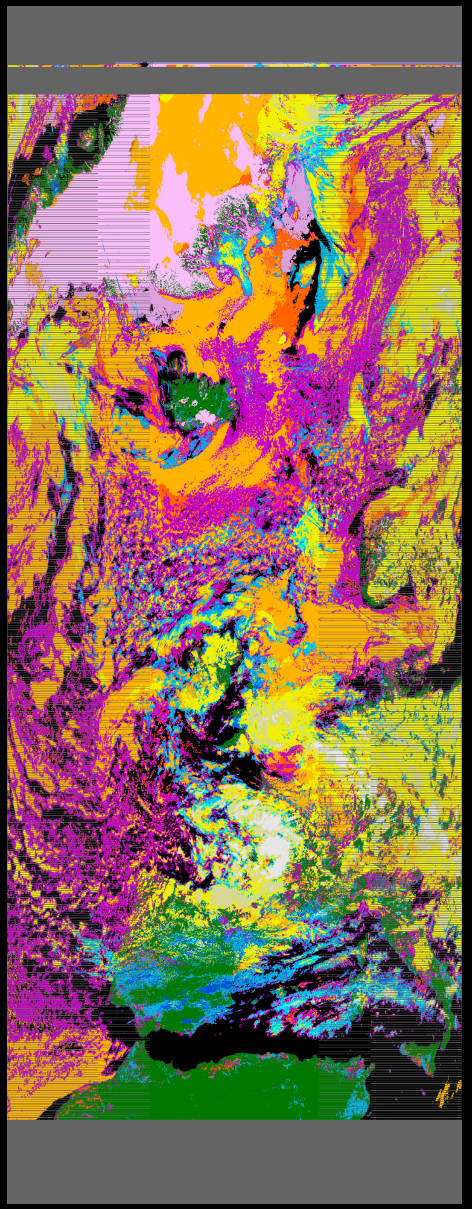
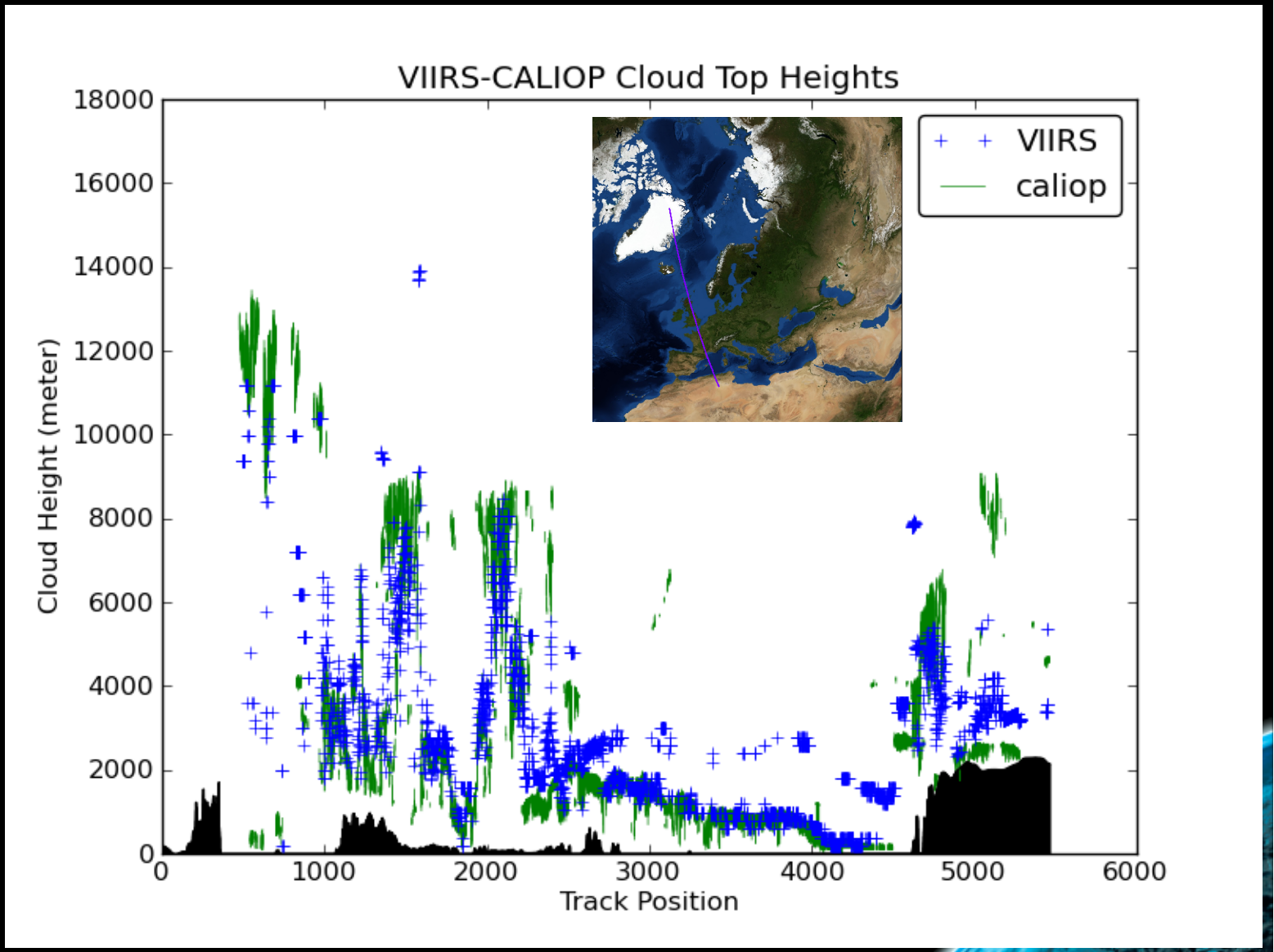
VIIRS Cloud Top Height





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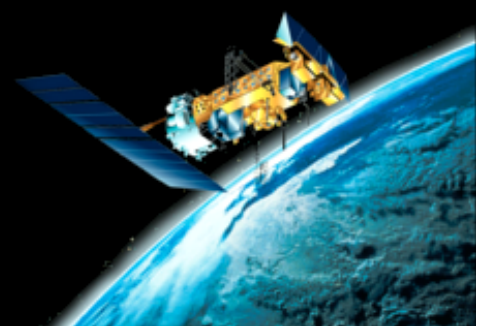
Use in Nowcasting



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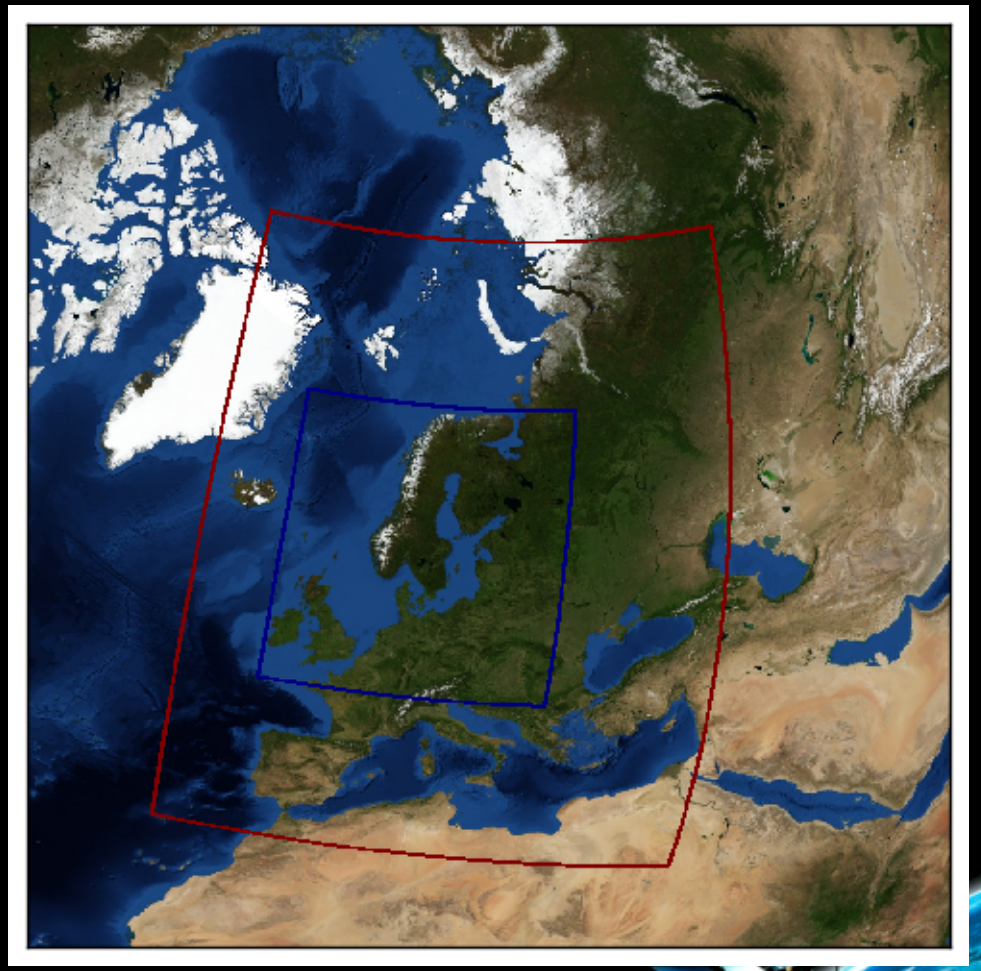
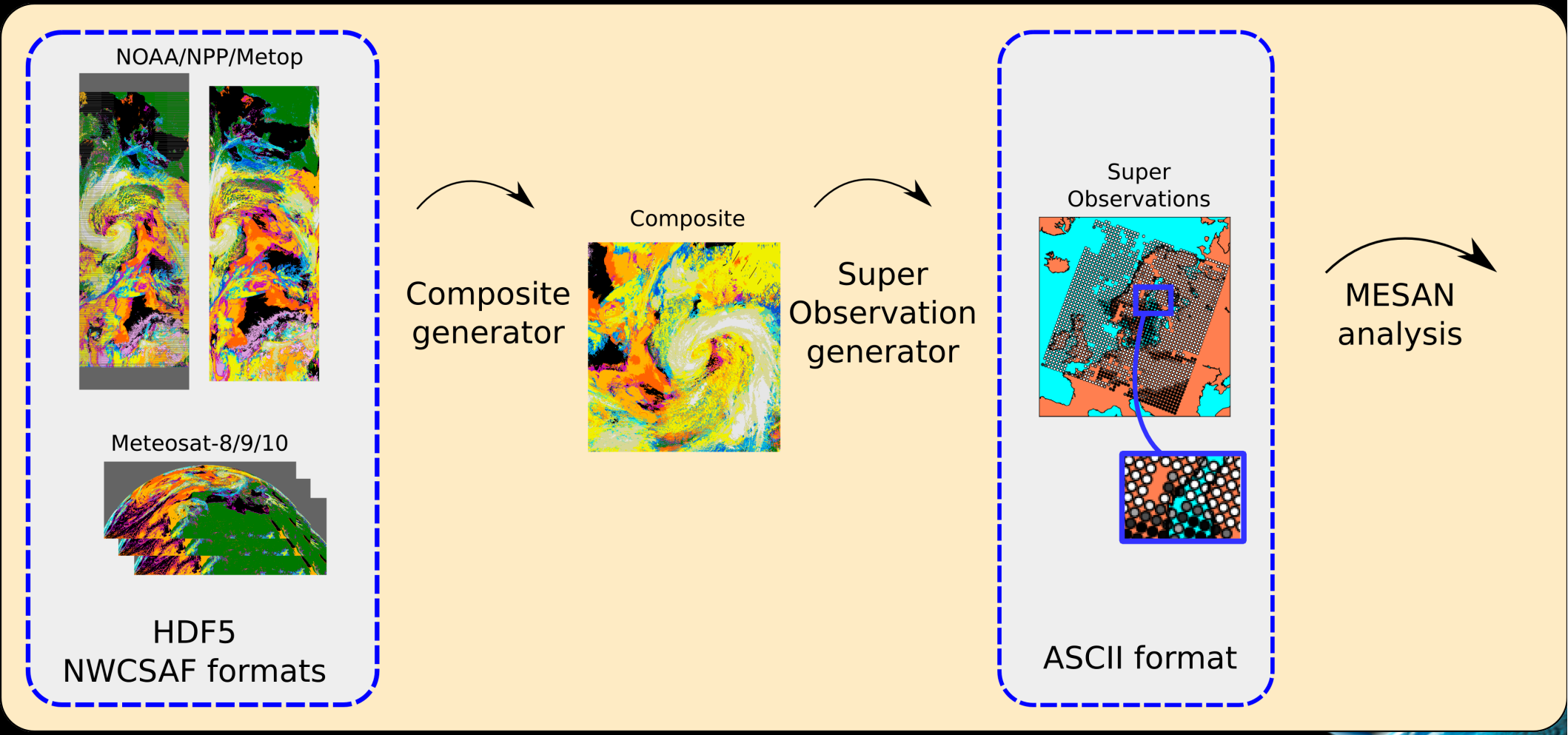
MESAN - MESoscale ANalysis

- Resolution: *11km every hour*
- Method: *Optimal Interpolation*
- Data:
  - *HIRLAM first guess*
  - *Satellite and Radar*
  - *Synop, Climate, Metar, etc*
  - *Physiographic fields*



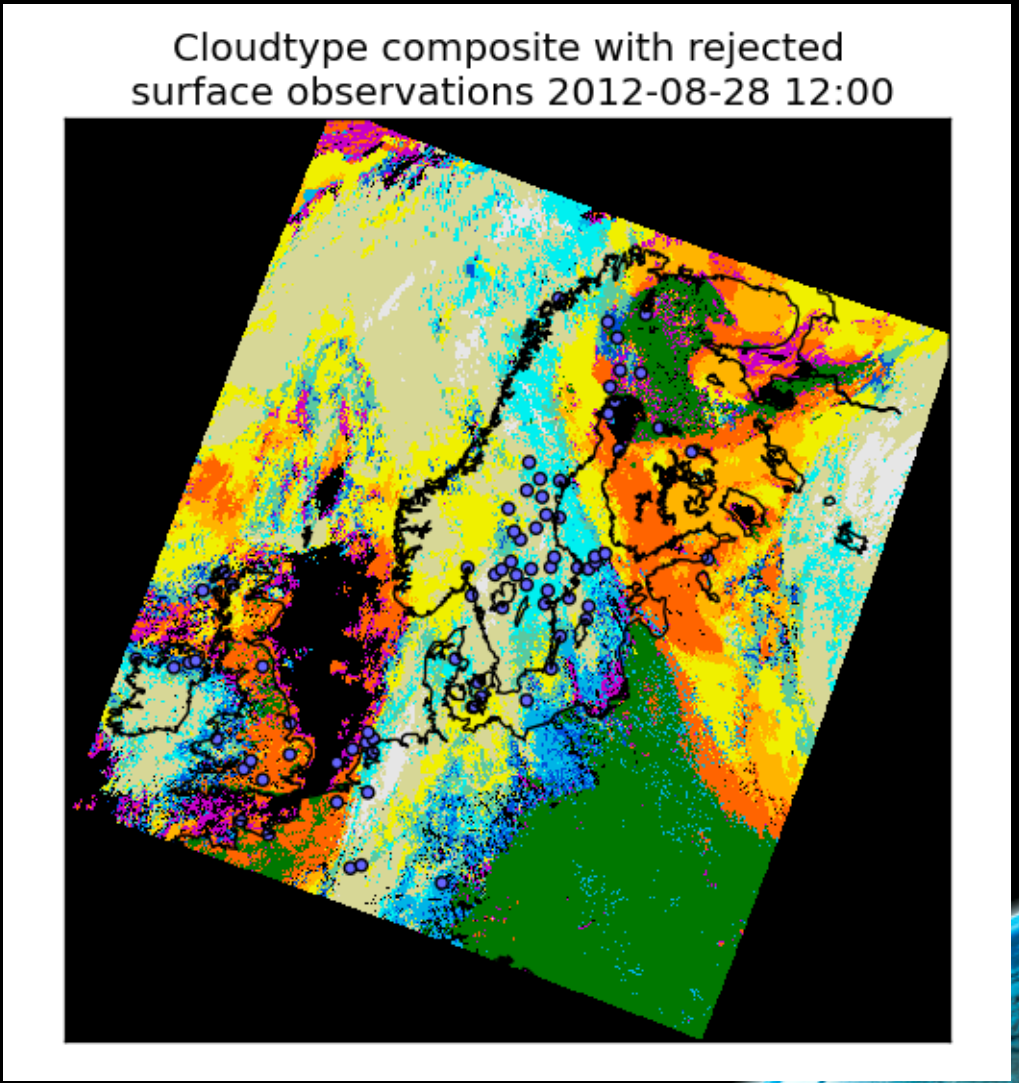
Composite and SuperObs generation



Positive impact using Satellite data

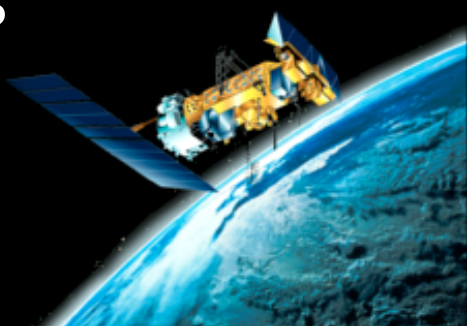
Example:

- Blue dots: cloudfree reports from automatic stations have been rejected – satellite obs show high clouds with high confidence



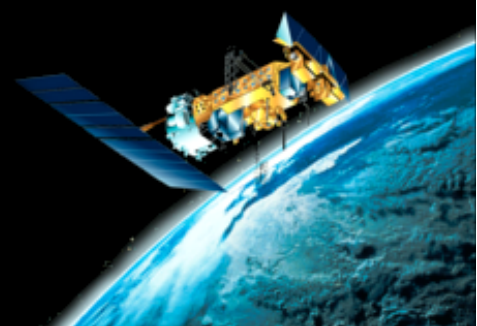
What's coming next

- 2013/Q1: CTTH patch speeding up semi-transparent cloud retrieval and picking up more Cirrus cloud heights
- **v2014**:
  - New output format: netCDF following CF conventions.
  - Cloud Mask: Revised surface treatment to reduce biases found in some regions



v2014

- Improved Cloud Top Height (prototyping with CALIOP data)
- Precipitating Cloud: Add rain rate using cloud microphysical products (daytime only). AVHRR & VIIRS



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