EUMETRAIN, 26/11/2015

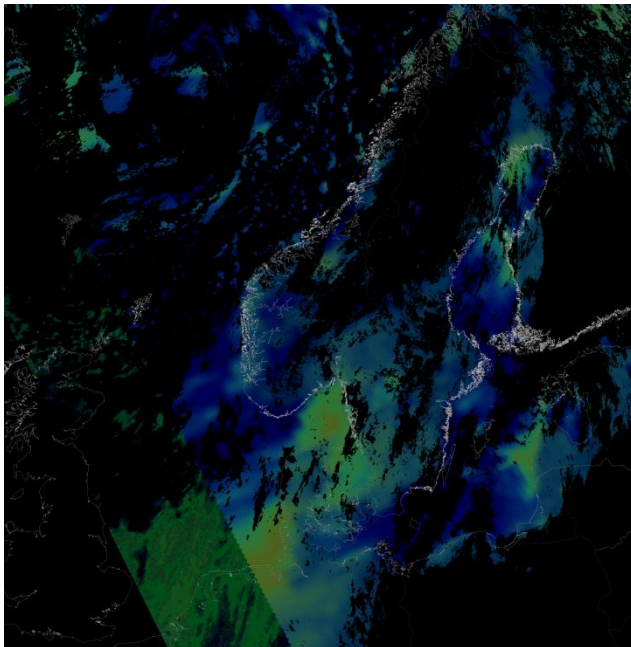# Precipitation Products PPS
Anke Thoss, SMHI

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Outline

- General thoughts on precipitation retrieval
- Precipitating Clouds Product PPS
- The Future: EPS-SG MWI/ICI

NOAA19, 2015-11-25, 06:16 GMT
Precipitating Clouds product

NORDRAD radar composite 6:00GMT

Probabilities / Rain rates

Which information do we have available on operational meteorological satellites received at NMS in real time to estimate precipitation?

High spatial resolution **VIS/IR**, including channels carrying microphysical information on cloud top (GEO/LEO). **GEO preferred due to time resolution!**

LEO before EPS-SG: MW sounding on relatively high spatial resolution (15km) for high frequency channels (89GHz and 150/157GHZ window channels, 183GHz bands for WV sounding). Information content: **scattering signature of precipitation size ice particles**
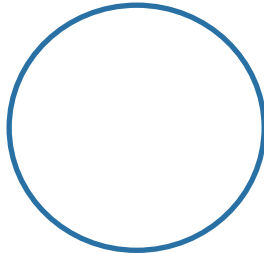
That means only information indirectly related to precipitation especially for cases not involving strong convection!
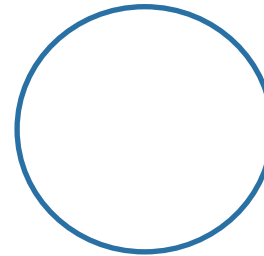
For general instantaneous estimates:
probabilities or rain rates with large error bars?

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Do you have the NWCSAF PPS package installed?

yes   **no**

http://www.nwcsaf.org

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I am using the following NWCSAF precipitation products:
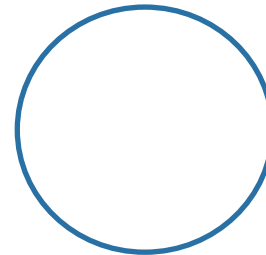
PPS precipitating clouds product:
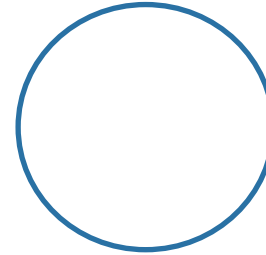
Any MSG precipitation products:

No NWCSAF precipitation products:

http://www.nwcsaf.org

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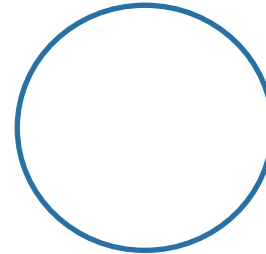
- **Precipitating Cloud product PPS: probabilities of precipitation for intensity classes**

LEO: Likelihood supplied for classes

- **no precip (< 0.1mm/h)**
- **Light/chance of precip (0.1mm/h - 0.5mm/h)**
- **Moderate precip (>0.5mm/h – 5mm/h)**
- **Heavy precip (>5mm/h)**

Application: Nowcasting, especially for complementing precipitation overview in areas without radar coverage

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Precipitating Cloud product PPS:

**Scientifically the PC algorithm
has not been changed since PPS v2008 (PC version 1.3)**

Technical adaptations were applied as needed:

- Visualisation and interpolation changes
  when going from area to swath processing

- Updated flags and output format (v2014, PC version 1.6)

Future:

**No further algorithm development or adaptation to new satellites.
Algorithm is likely to be technically maintained
for MHS onboard NOAA and METOP satellites, if still requested by users**

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NWCSAF PPS Precipitating Clouds algorithm outline

- AMSU-B/MHS estimate of precipitation likelihood based on scattering signature

    SI=Tb89 - Tb150 – corrections(θ)

- For MHS (NOAA18… and METOP) the 157GHZ channel is corrected to simulate 150GHZ behaviour with help of RTM calculations. Correction factor applied: corr (Tb89,Tb183, θ)

- Separate estimates over land and sea, in coastal areas blended estimate according to land/sea fraction

- Likelihood of precipitation estimated in intensity classes is mapped to SI based on histograms of scattering index versus NORDRAD data.

- Using AVHRR and NWCSAF Cloud type product to screen out non-precipitating areas (statistically verified with BALTRAD/NORDRAD data)

Visualisation:

Precipitating Clouds:

RGB of **likelihood** of instantaneous precipitation in intensity classes

Red: intensive (≥ 5mm/h)

Green: light/moderate (0,5 – 5mm/h)

Blue: risk/very light (0,1-0,5mm/h)

Based on MHS
and AVHRR ch4&5
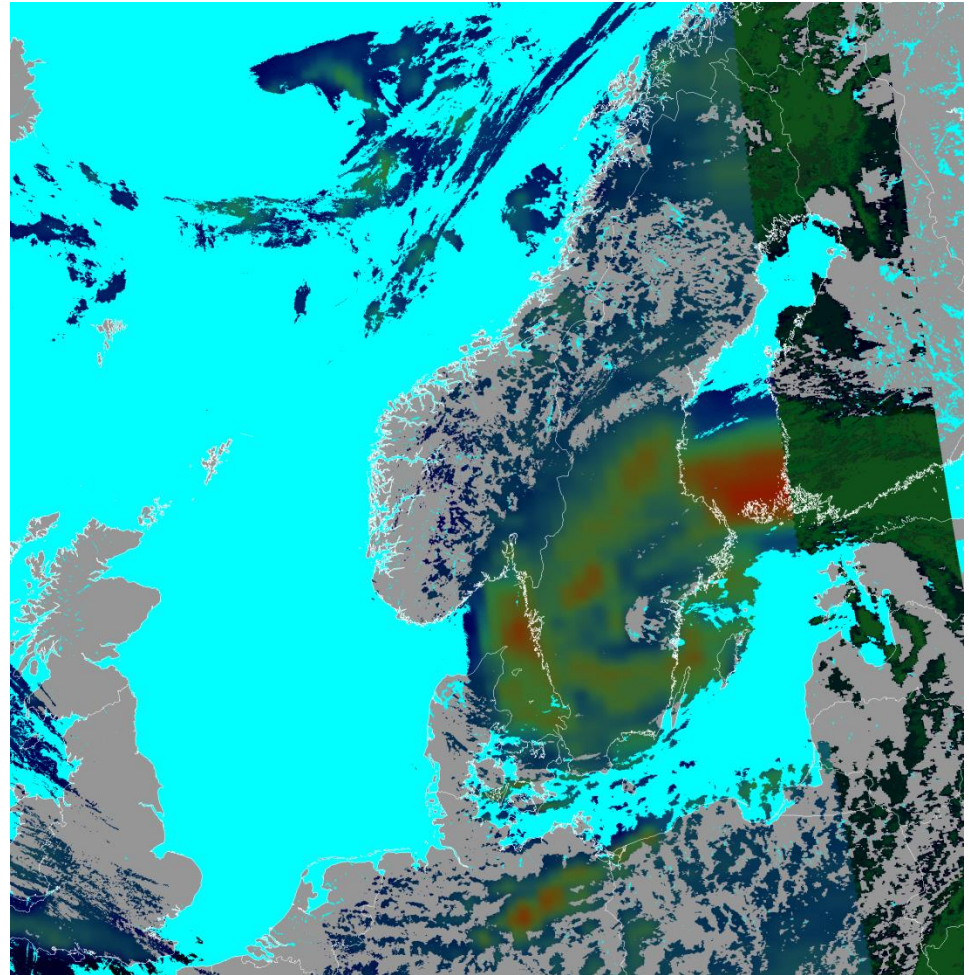
NOAA19 2012-06-25, 12:22 UTC

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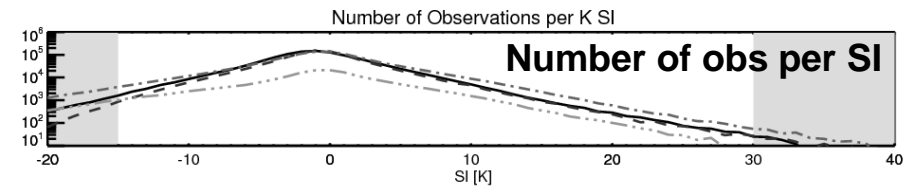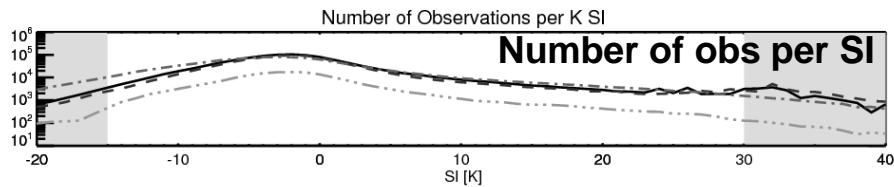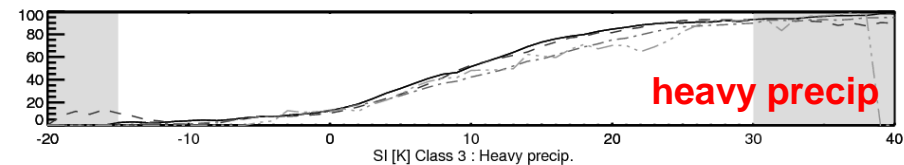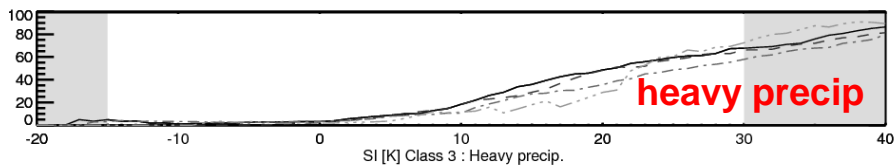Satellite Application
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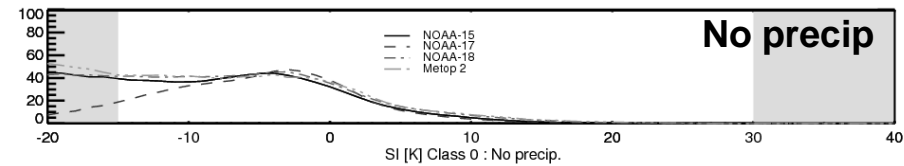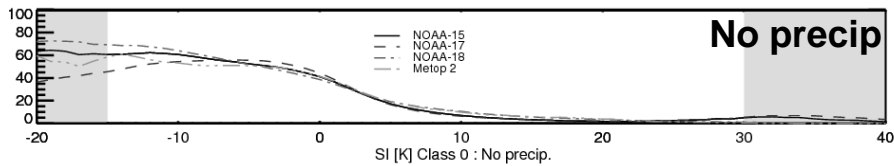Very Short Range Forecasting

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NWCSAF Precipitating Clouds algorithm
mapping of probability to scattering index

solid line: algorithm
dashed and dotted lines: separate satellites. NOAA satellites june 2006-may 2007, metop (dashed) March-May 2007

SEA — LAND

Probability [%]

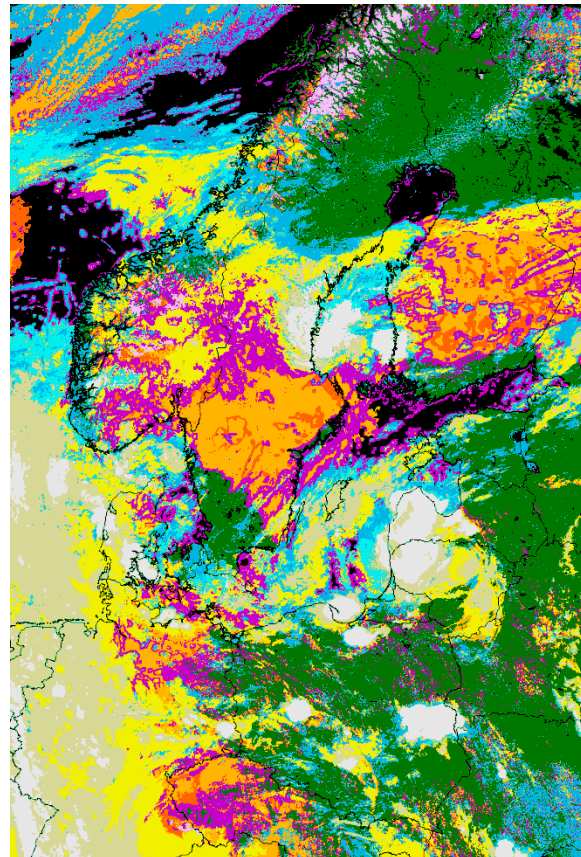No precip — Risk for/light precip — moderate precip — heavy precip — Number of obs per SI
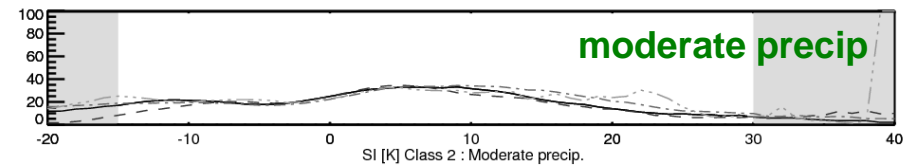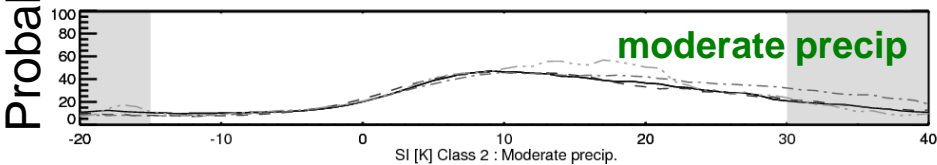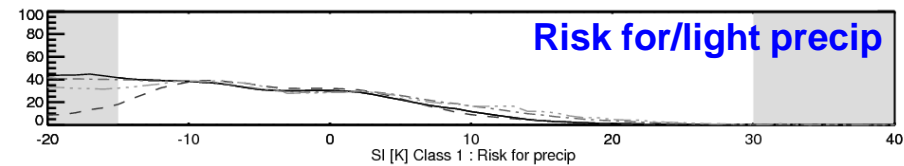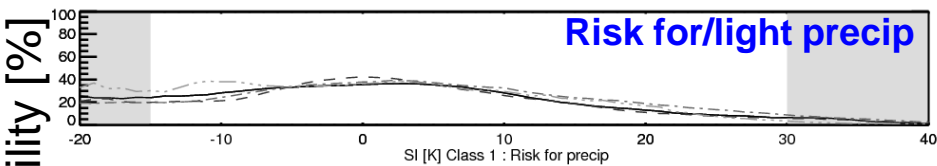
SI [K]

NWCSAF PPS Precipitating Clouds algorithm

comparison of NWCSAF Cloud type classification (used in filtering of PC product)
with BALTRAD data, statistics over 2 years of data, additionally IR only PC estimate
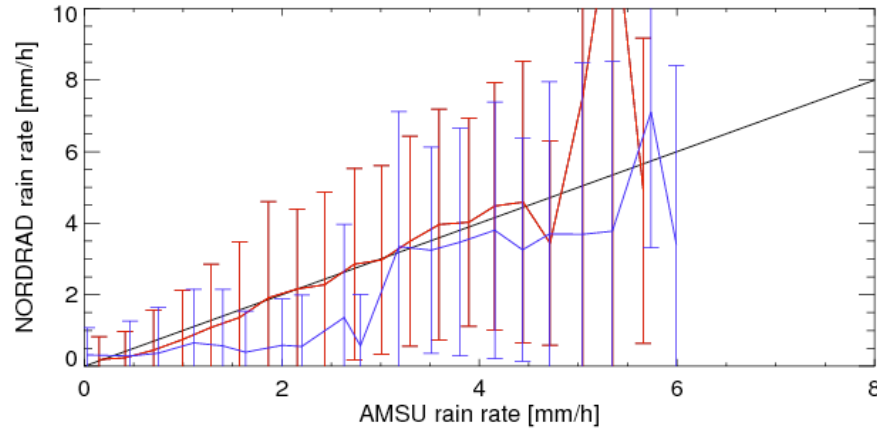is used to further screen out events with less than 5% precipitatin likelyhood

- Cloud free   0.5%
- Very low cloud   0.6%
- Low cloud   2.1%
- Medium level cloud   9.3%
- High opaque cloud   19.5%
- Very high opaque   28.1%
- Very thin cirrus   2.0%
- Thin cirrus   1.5%
- Thick cirrus   5.7%
- Cirrus over lower clouds 3.2%
- Fractional clouds   0.9%

*cloud classes treated as
potentially precipitating
in precipitating cloud algorithm
marked green*

Non-processed
Cloudfree land
Cloudfree sea
Snow contaminated land
Snow contaminated sea
Very low clouds
Low clouds
Medium level clouds
High opaque clouds
Very high opaque clouds
Very thin cirrus
Thin cirrus
Thick cirrus
Ci above low level clouds
Fractional clouds
Undefined
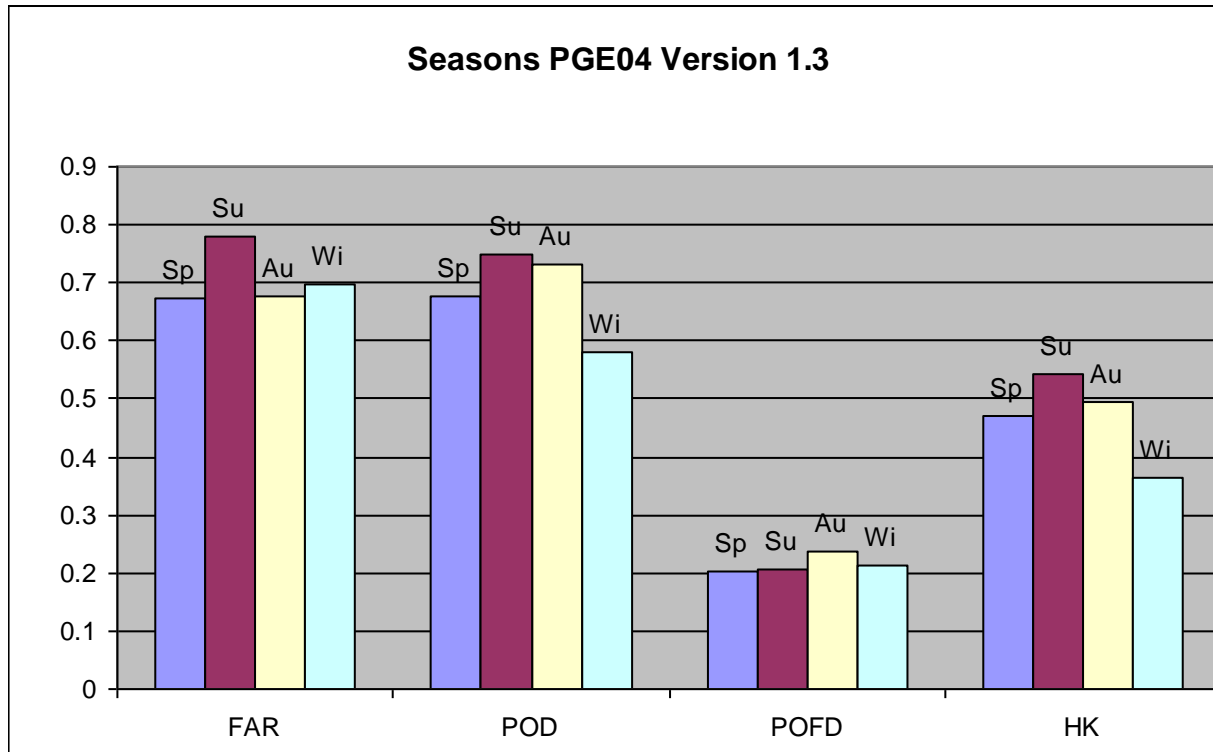
Noaa18 20070529 1116Z

11

Precipitation rate from AMSU/MHS

Upper: Rain rate retrieval
(not implemented)
based on same dataset
as likelihood retrieval for
Land and Ocean
Comparison against
NORDRAD data, error bars
Denote standard deviation
in intensity bin
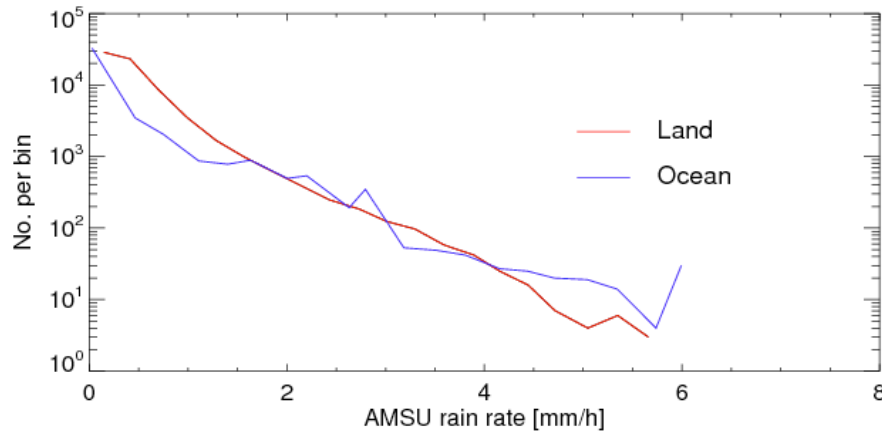
Lower: number observations
per intensity bin

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Validation combined AMSU/IR on different Seasons

Validation for v2008 for year 2007, algorithm unchanged since than

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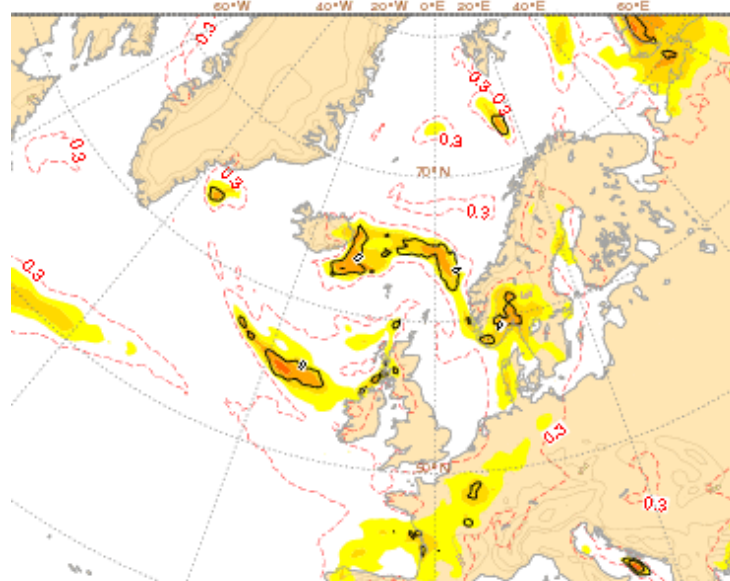Support to Nowcasting and
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"Malmö" storm 2014-08-31

causing severe flooding in Malmö and Copenhagen
of locally up to 100mm/12h

PC NOAA18 05:12Z
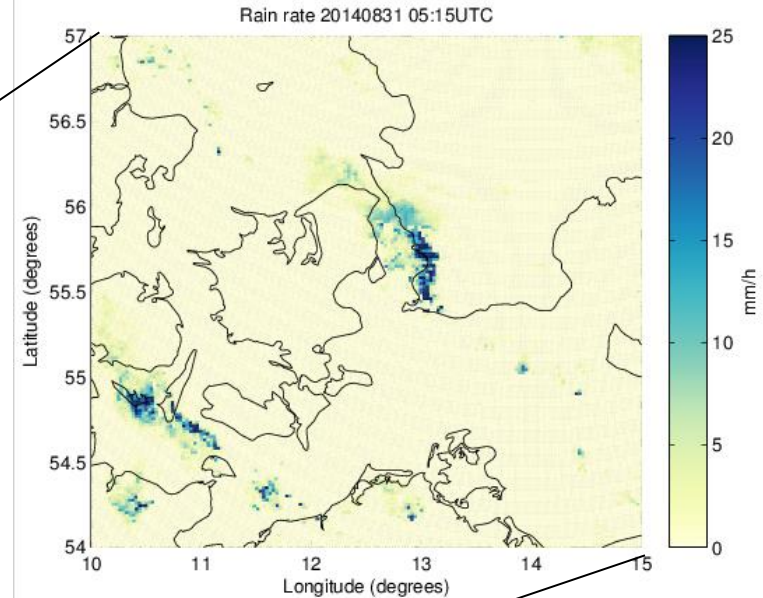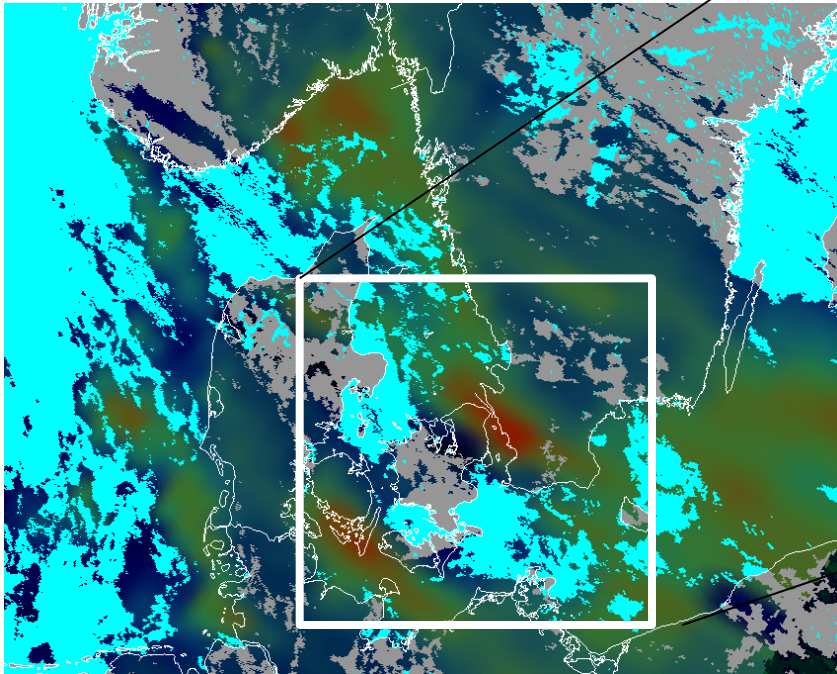
NORDRAD
05:15

Rain rate 20140831 05:15UTC

2015-02-23
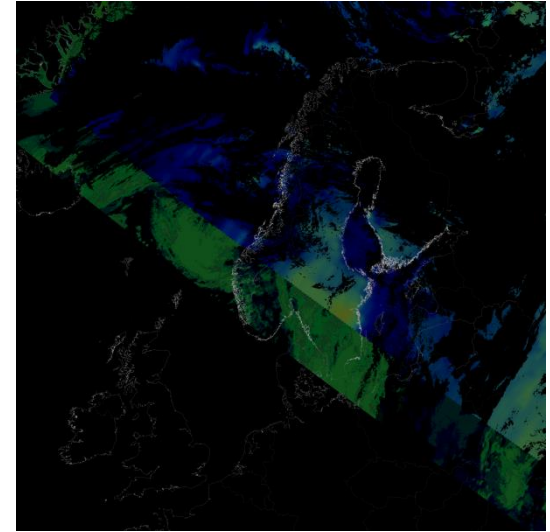
PC NOAA18 05:18Z
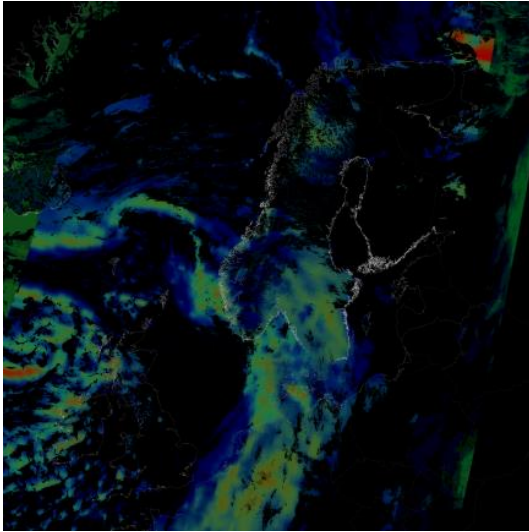
PC METOP1 09:30Z
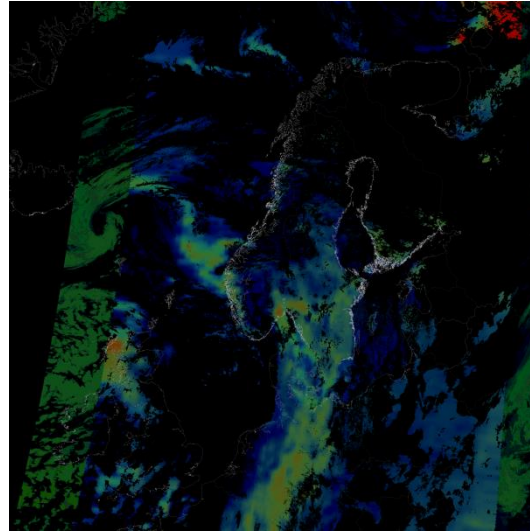
PC NOAA19 10:27Z
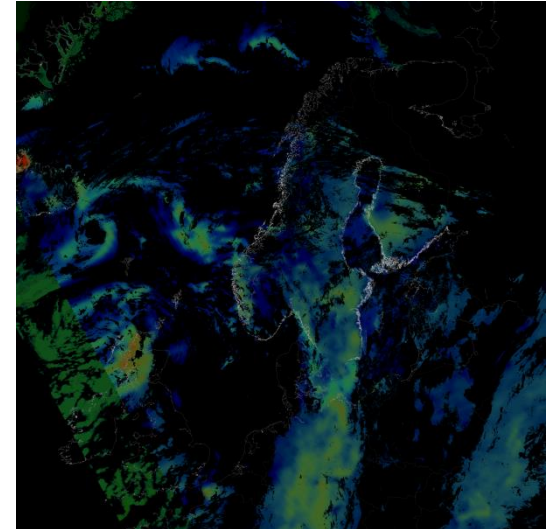
PC NOAA19 12:06Z
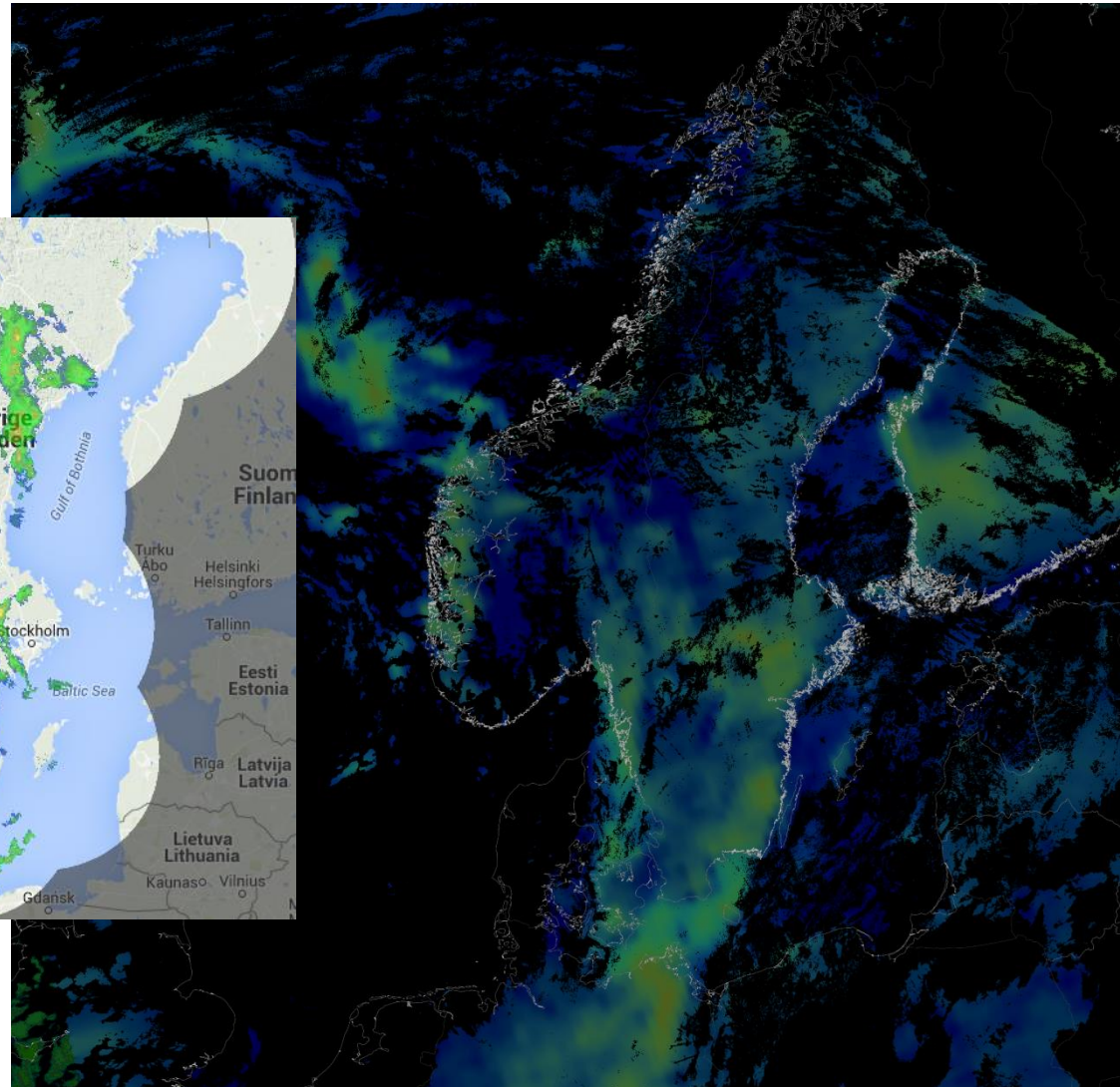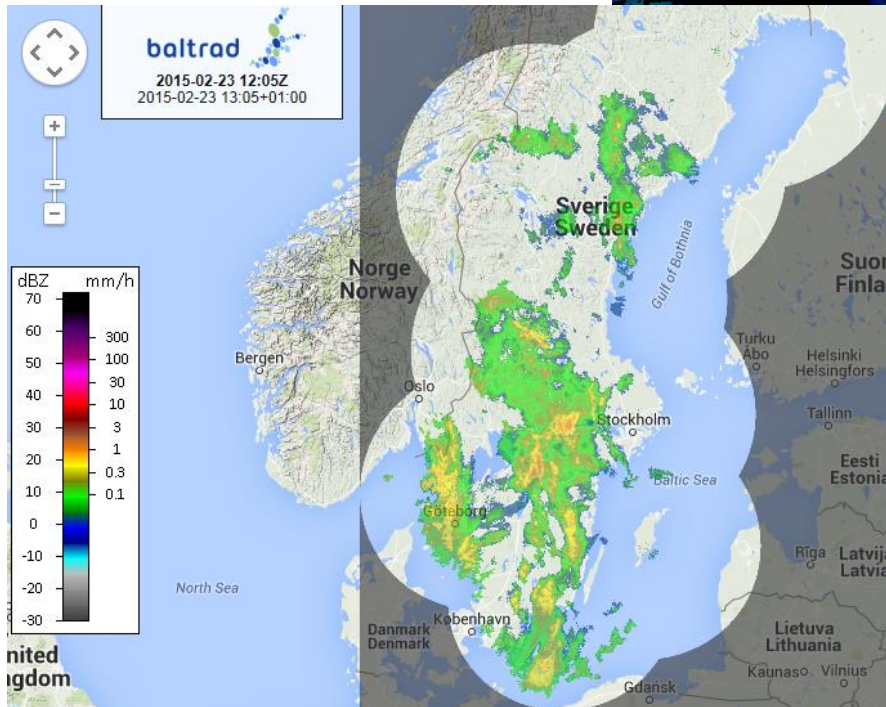
**ECMWF
Extreme Forcast
Index
local precipitation,
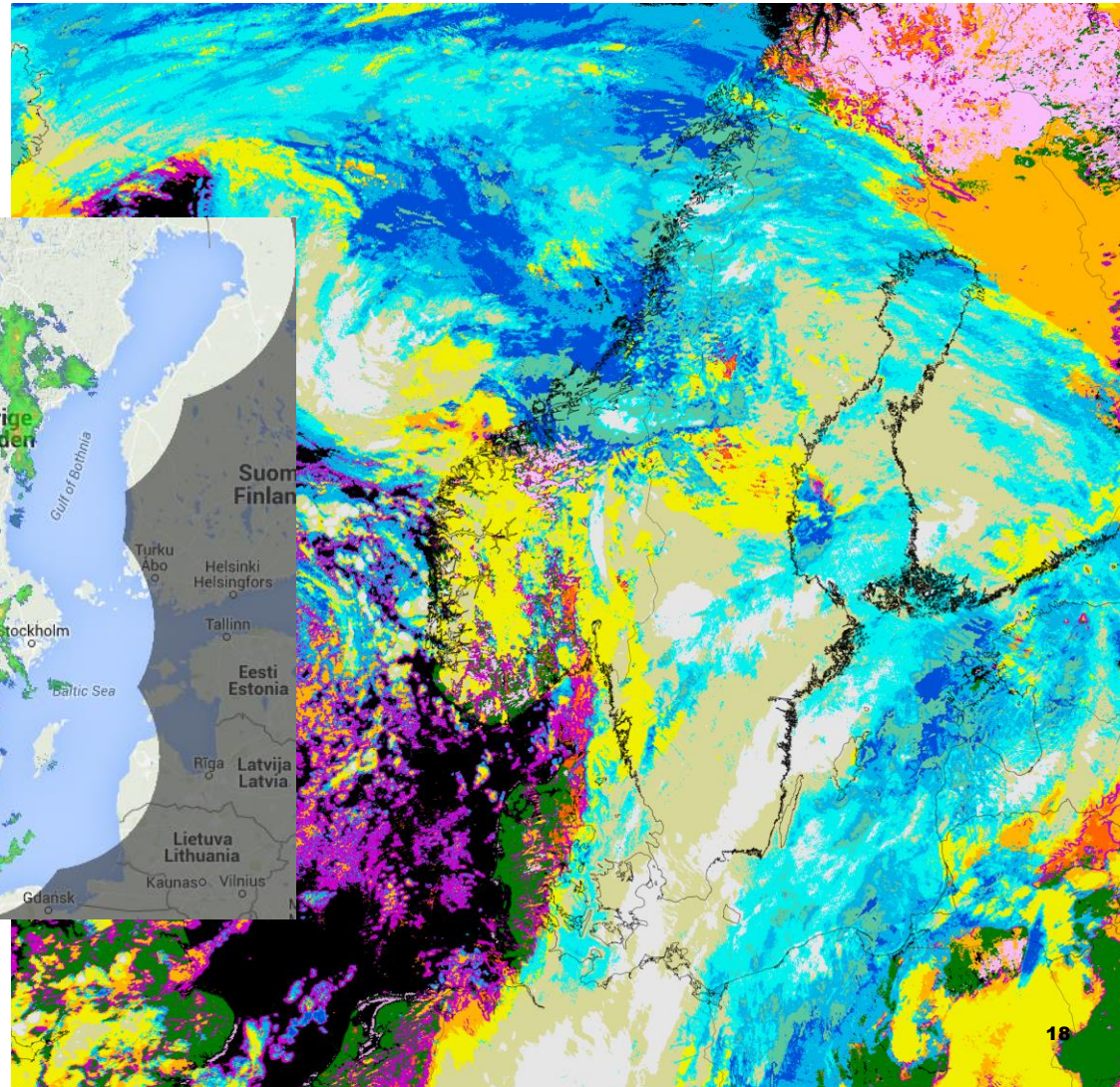2015-02-23 00Z –
2015-02-24 00Z**

PC product and
BALTRAD radar composite
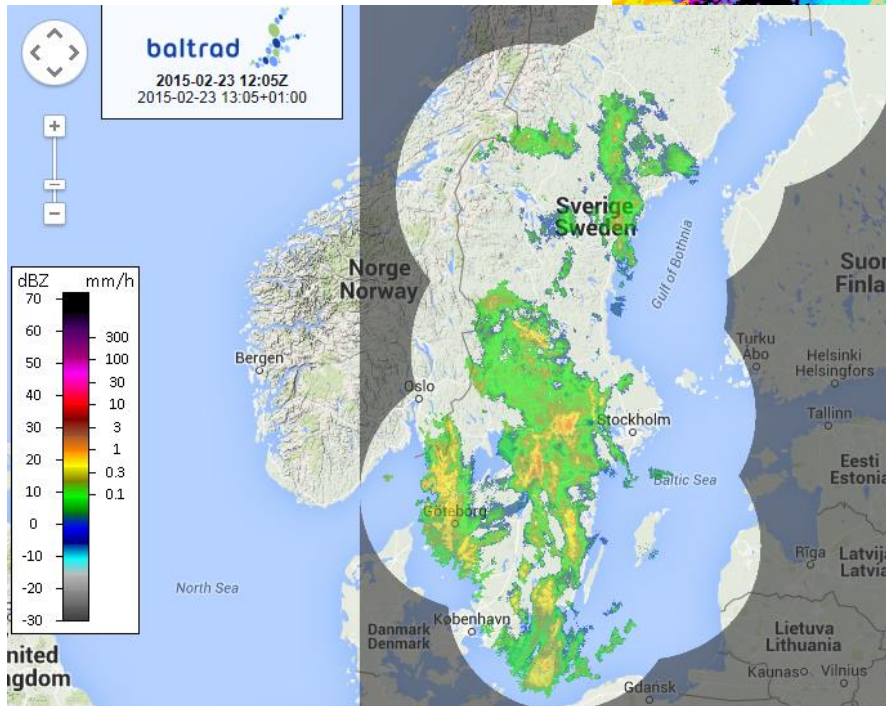
2015-02-23 12:05Z

PC product and
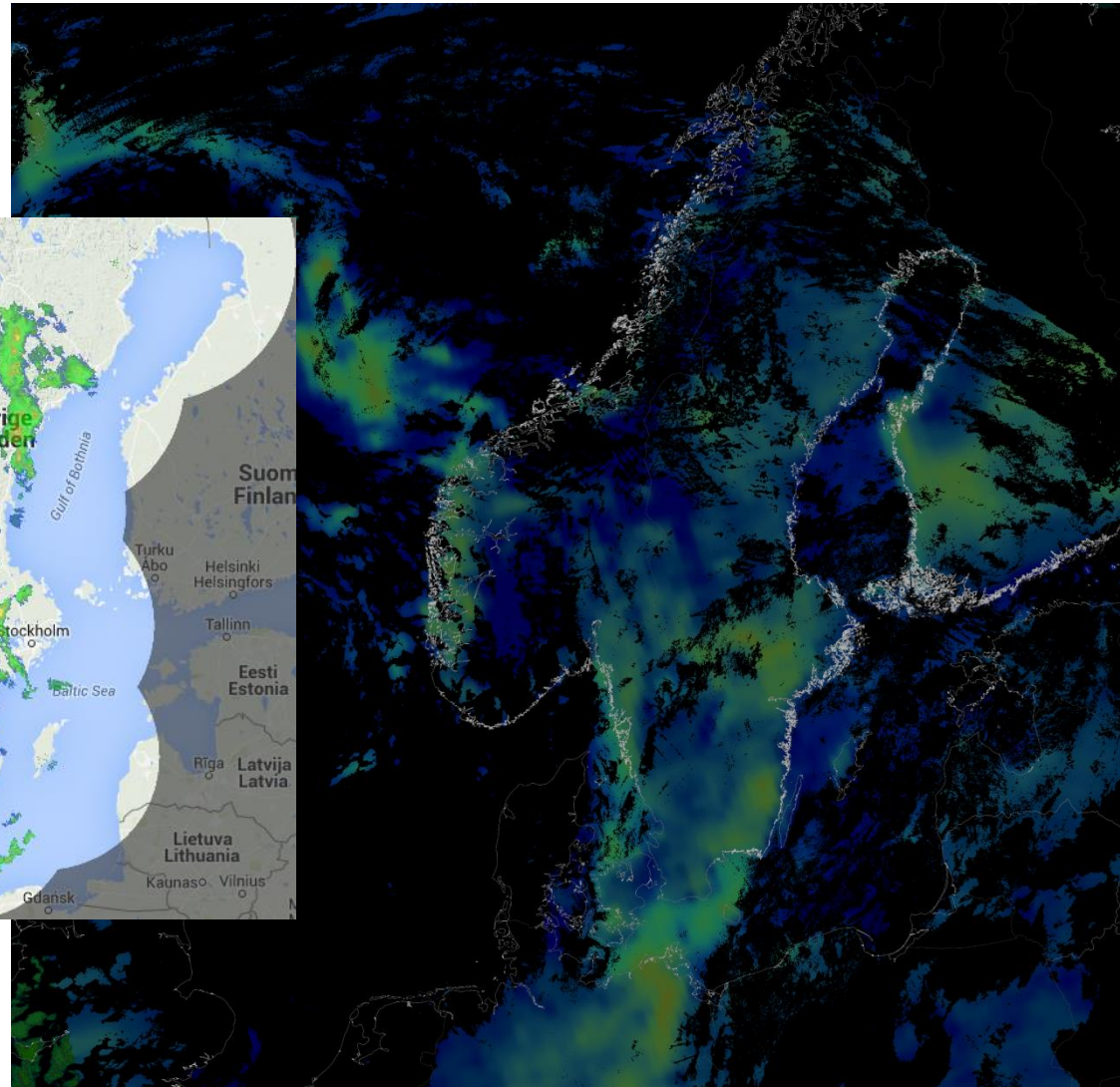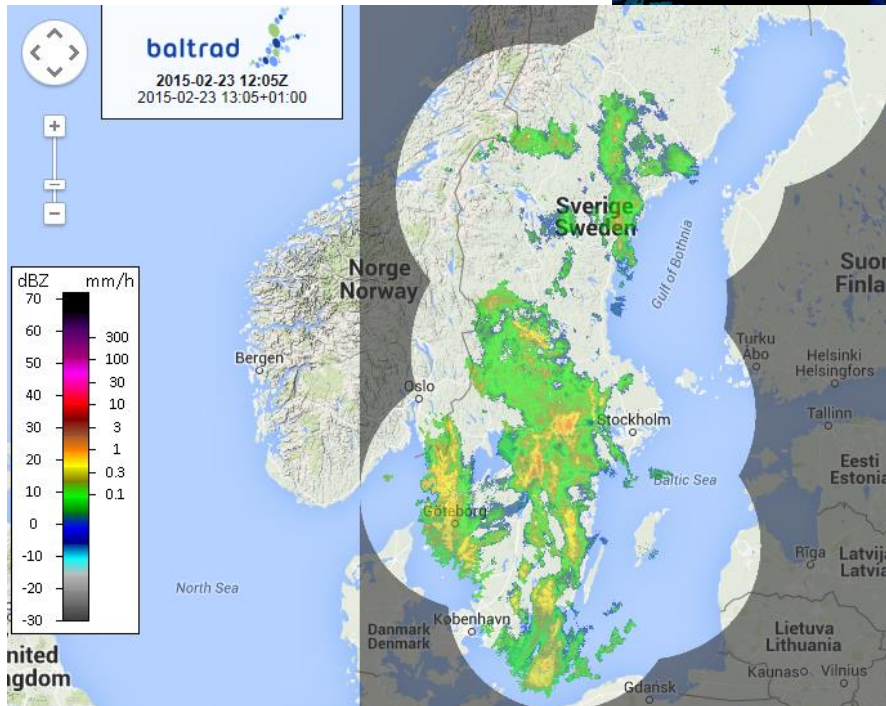BALTRAD radar composite

2015-02-23 12:05Z

PC product and
BALTRAD radar composite

2015-02-23 12:05Z

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The Future: METOP-SG-B1 (launch 2022)

➢ **MWI: MW imager**

➢ **ICI: submillimeter imager with high sensitivity to cloud ice**

➢ **In collaboration with Chalmers Technical University, NWCSAF is developing a day-1 Ice Water Path (IWP) retieval from ICI to be implemented in EUMETS AT Ground Segment and in PPS**

➢ **We would like to take advantage of precipitation algorithm development at HSAF and CMSAF, and implement an (TBD) MWI precipitation retrieval in the PPS software for nowcasting purposes**

➢ **We would also like to make available the CMSAF MWI LWP retrieval in PPS**

➢ **We would like to collaborate on combined MWI/ICI precipitation and snowfall retrievals (CDOP4)**

➢ **Implementations foreseen in 2023 or 2024 (CDOP4)**

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Thank you for listening!

Any questions?