# SAF NWC CLOUD PRODUCTS

## USER EXPERIENCES AND RESULTS FROM EVALUATION 2003-2005

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**SWEDEN**

## Evaluation of SAF NWC PPS

- Objectives
- Background
- Method
- Results
- Exemples
- Conclusions

## Experiences using SAF NWC PPS/MSG in Nowcasting

- Background
- Exemple
- Concluding remarks
- Way foreward

# OBJECTIVES

- To get a qualitative assessment from the meteorologists that use the products.
- To find any systematic faults and typical problems.
- To awaken an interest for the new products.

# BACKGROUND

- SMHI participating in SAF NWC, responcible for the products:
  - Cloud Mask (CM)
  - Cloud Type (CT)
  - Cloud Top Temperature and Height (CTTH)
  - Precipitating Clouds (PC)
- Products available from autumn 2002
- Evaluation from winter 2003 ➔2004

# METHOD

- Meteorologists from three sites in Sweden (Frösön, Luleå and Linköping) participated
- Area SSWE (South Sweden) and NSWE (North Sweden) has been eveluated
- Comparisons with SYNOP, radar, radiosoundings, IR and VIS channels, SCANDIA, AMDAR and QBC from aeroplanes.
- 90 cases

# METHOD (cont.)

**Eached case was evaluated on a scale between 1 and 4**
**where:**

**1 = REJECTED**

**2 = PARTLY REJECTED**

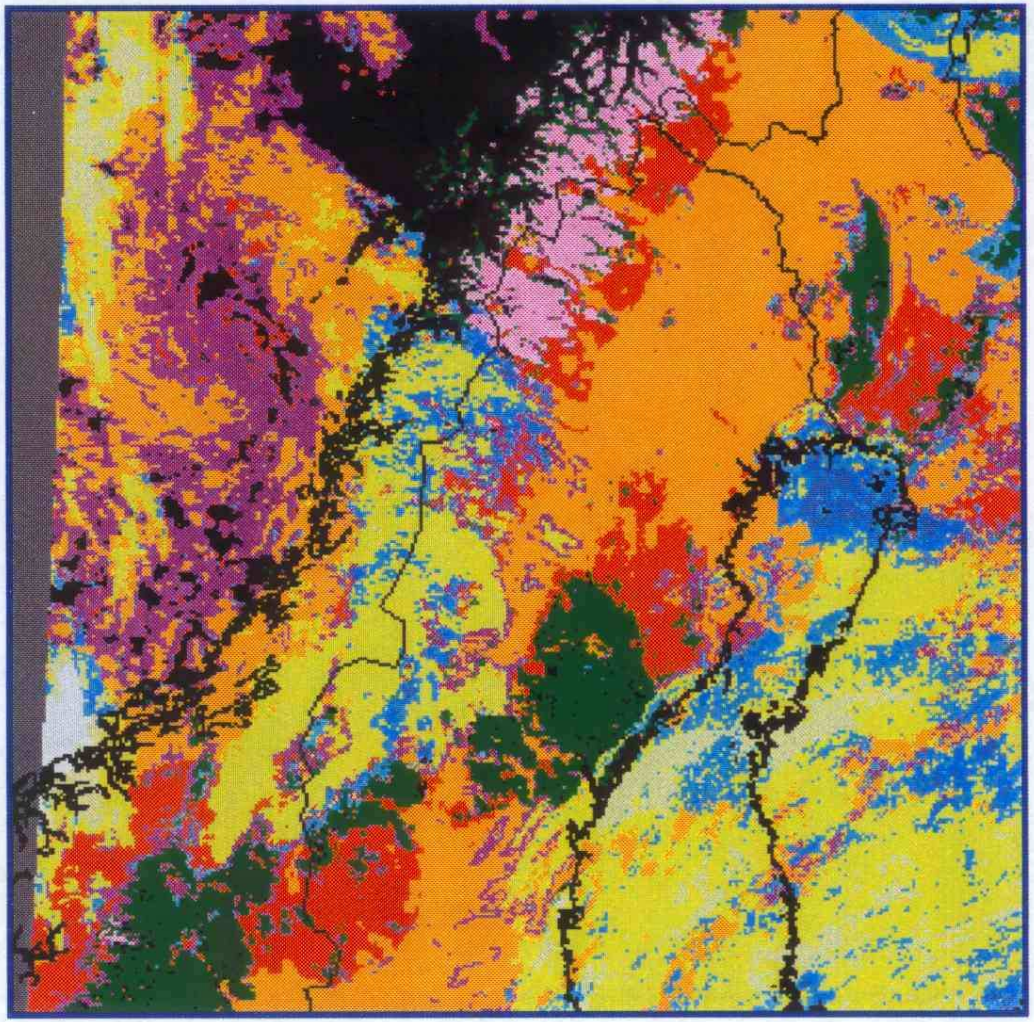
**3 = ACCEPTED**

**4 = VERY WELL ACCEPTED**

# noaa17-06609/nswe: 2003-10-2 09:02 UTC

**Previous** (noaa17_20031002_0902_06609.germ) Index **Next** (noaa17_20031002_0902_06609.sswe)

previous | visRGB | irRGB | Reset



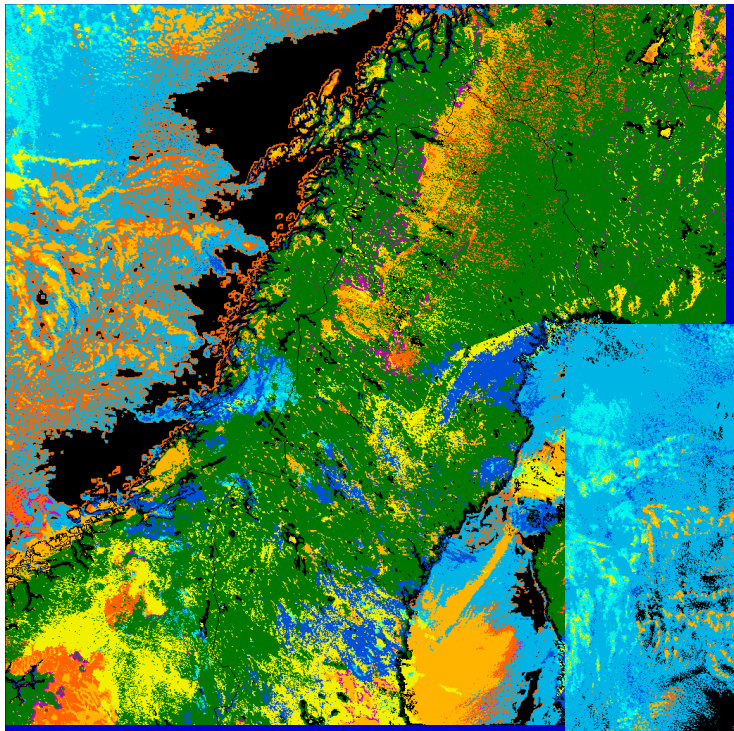
- Cloud free
- Cloud free
- Snow
- Snow/Ice
- Very low
- Low
- Medium level
- High
- Very high
- Very thin cirrus
- Thin cirrus
- Thick cirrus
- Cirrus above
- Fractional
- Unclassified
- Unprocessed

# Averaged marks for Cloud Type

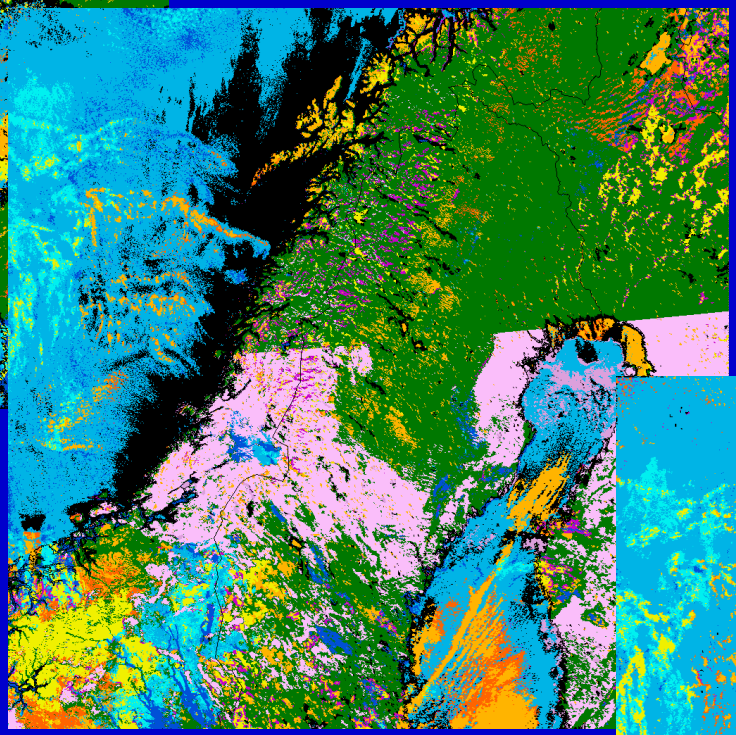
| | |
|---|---|
| OVERALL IMPRESSION | 3.2 |
| HORIZONTAL COVERAGE | 3.3 |
| CLOUD TYPE | 3.0 |

2004-01-20

- H-ridge in North
- Cold Air
- Cold snowfall

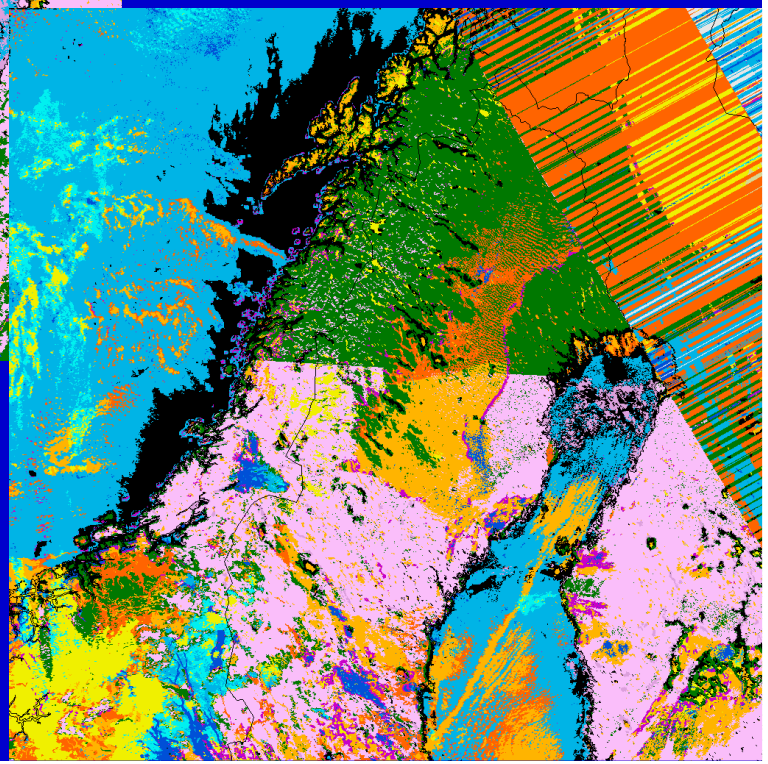


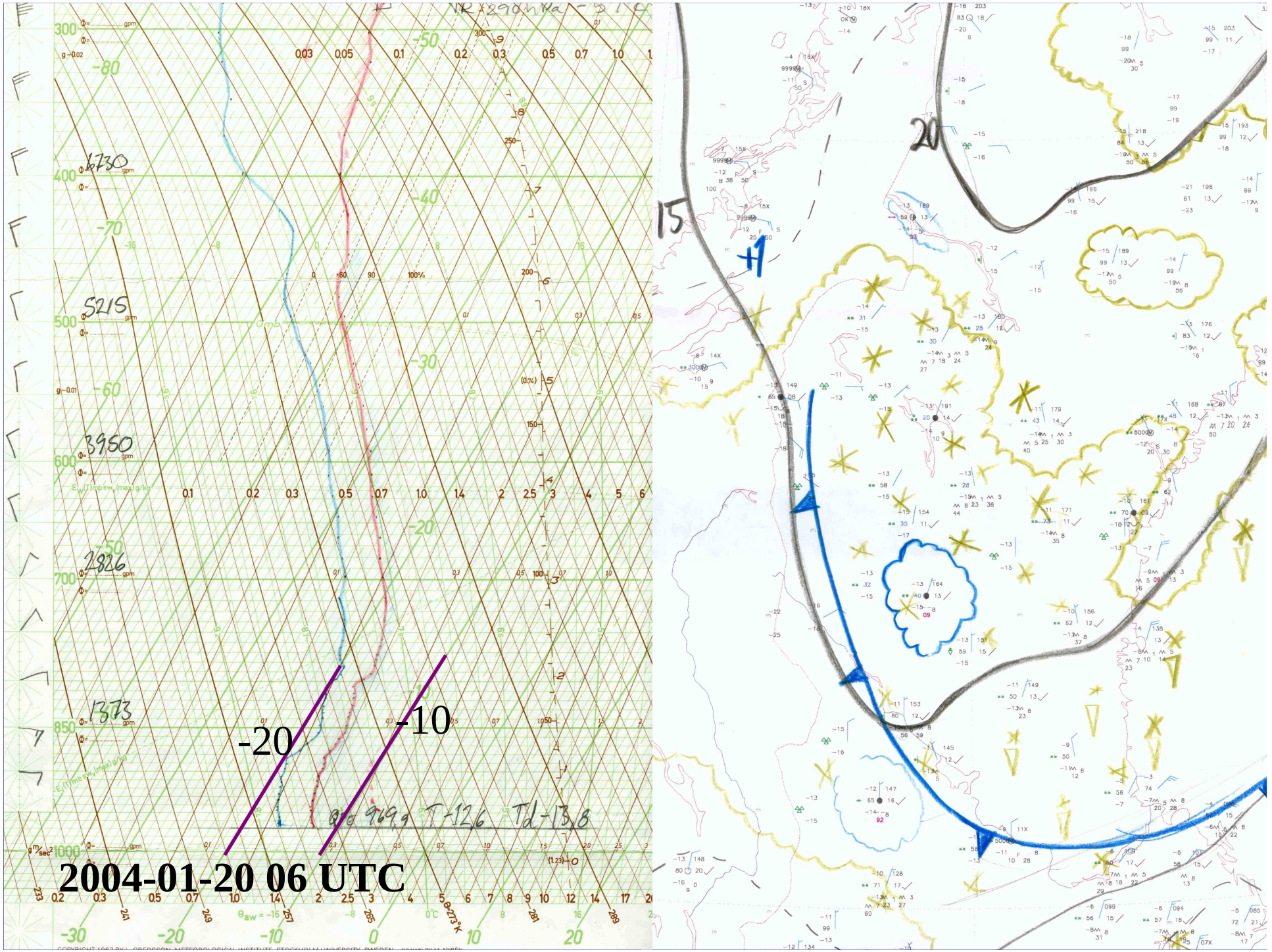
06.24 UTC

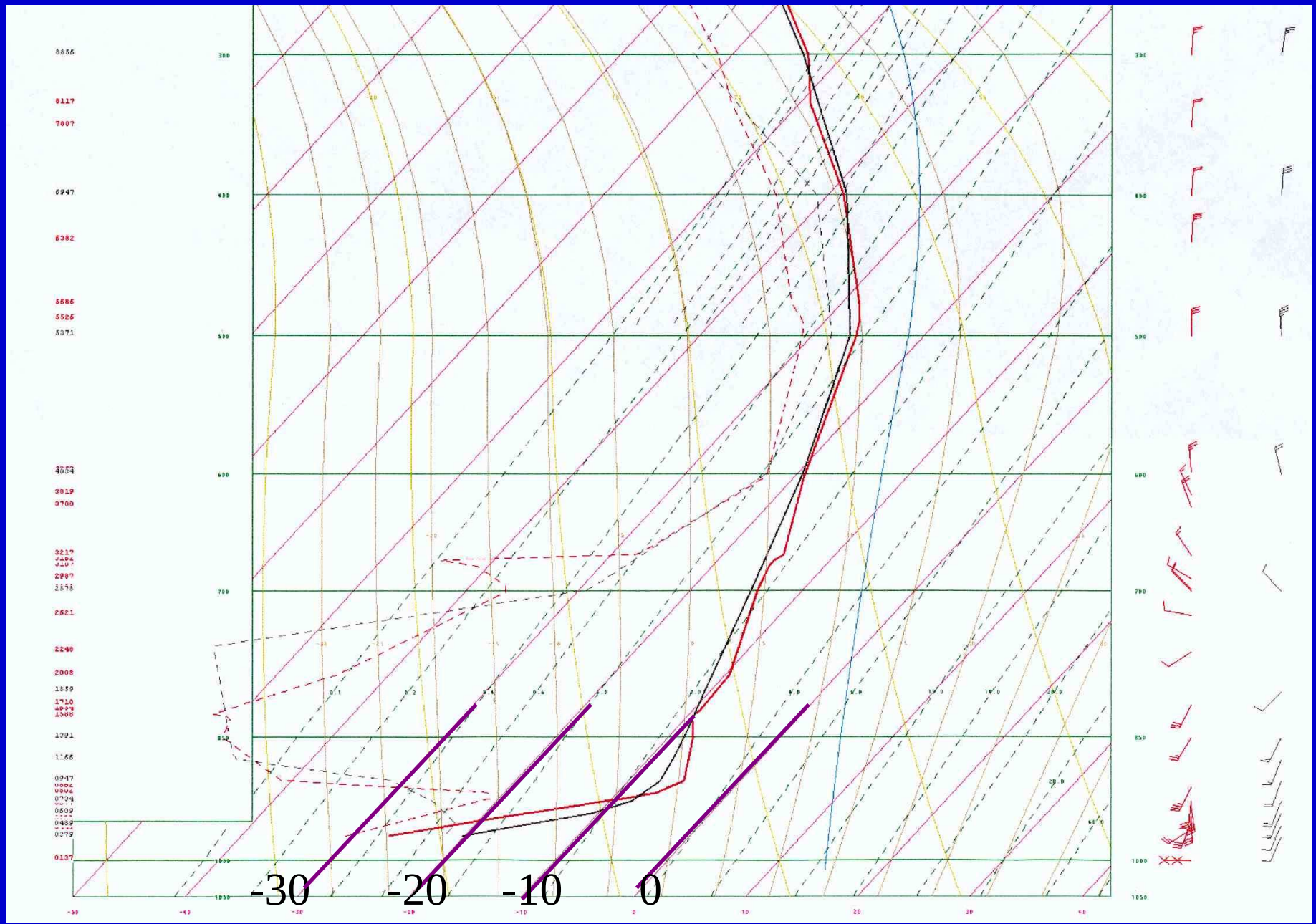


09.11 UTC

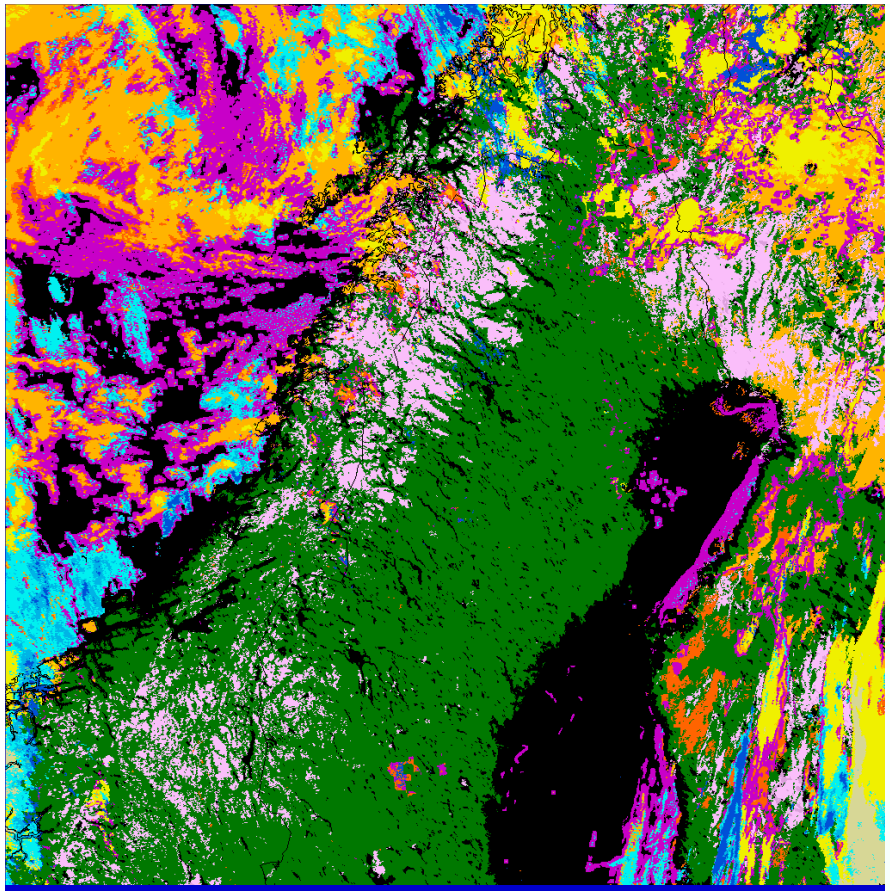
11.21 UTC



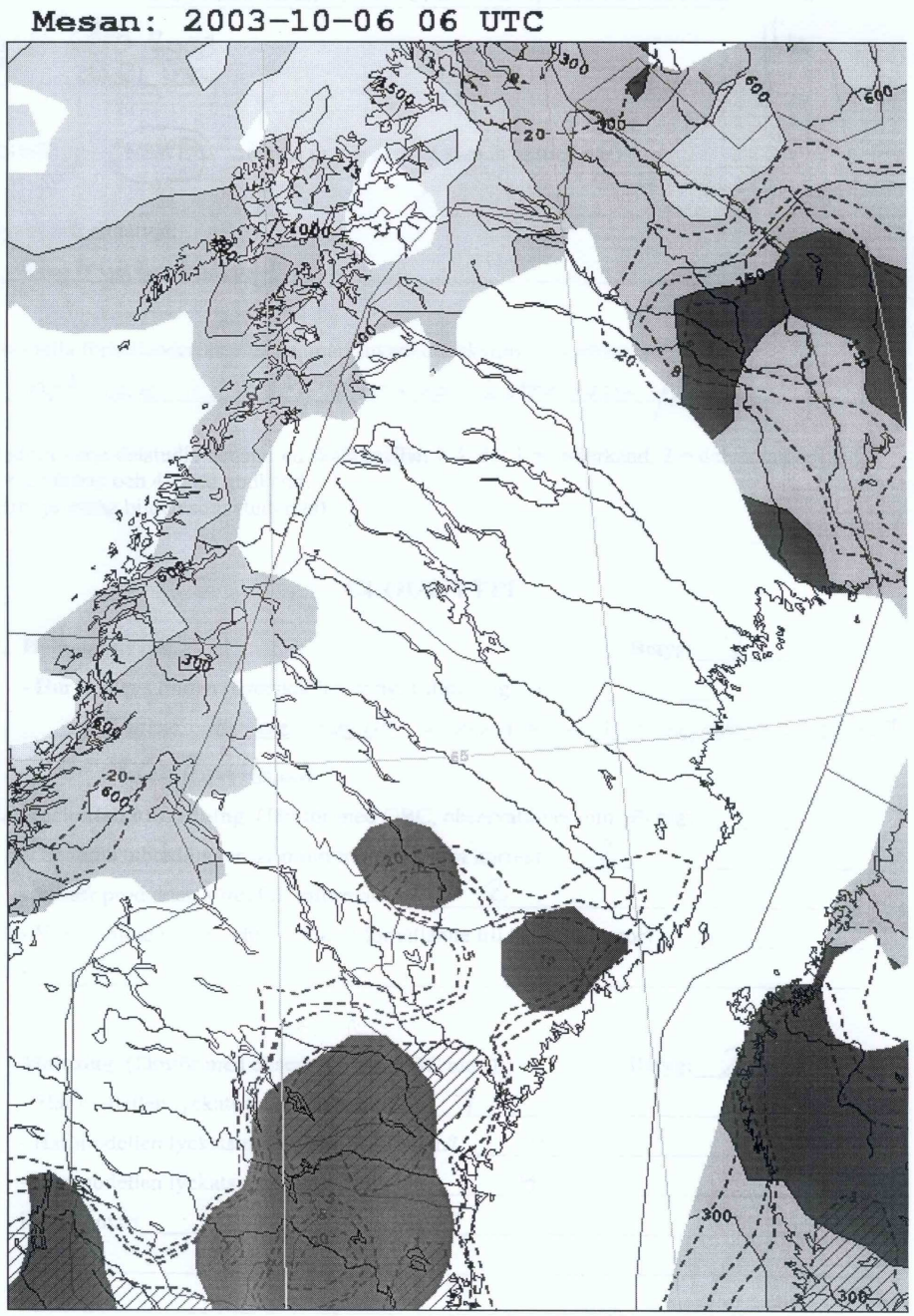

6730
5215
3950
2826
1373
-20
-10
2004-01-20 06 UTC

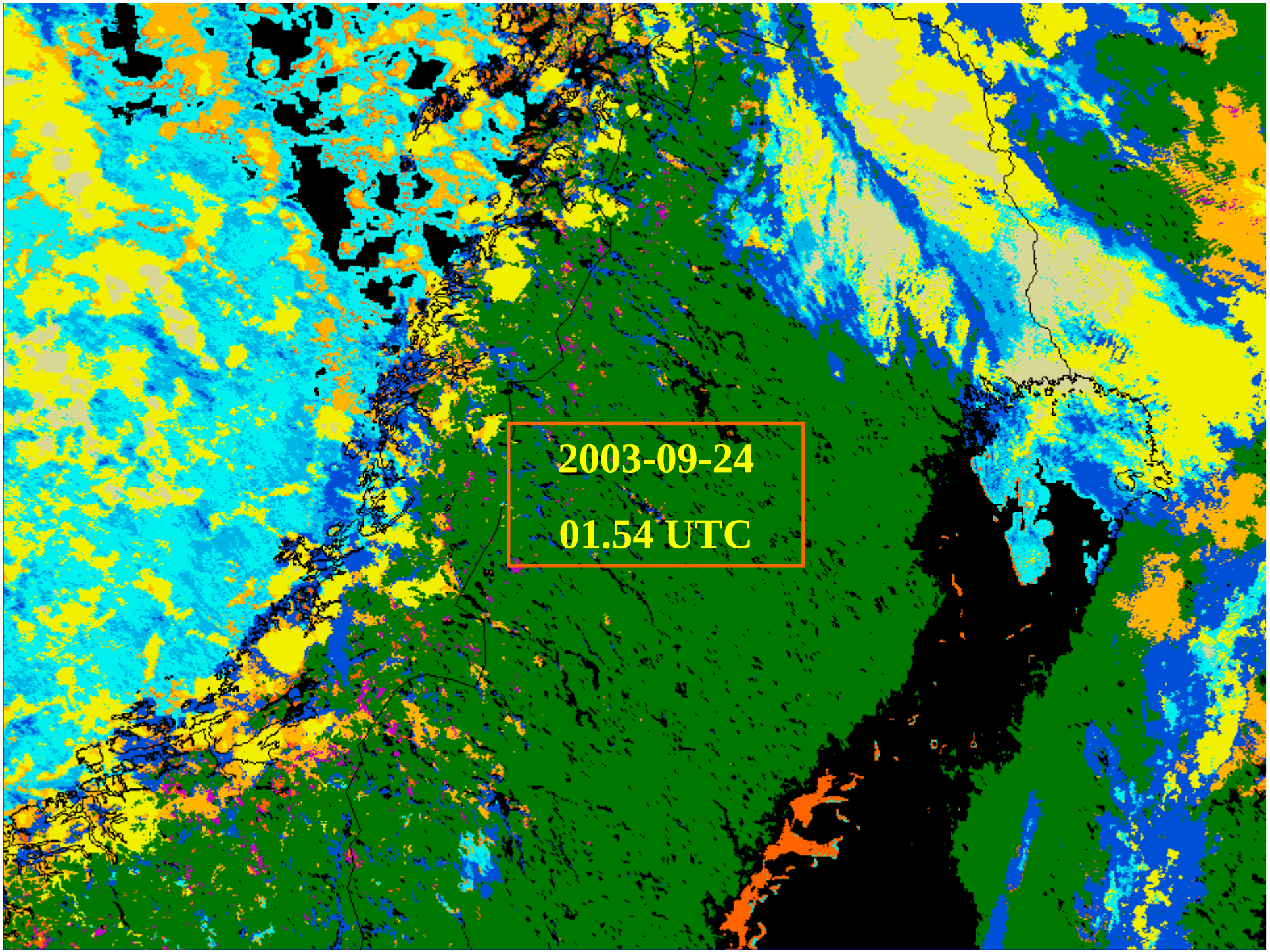


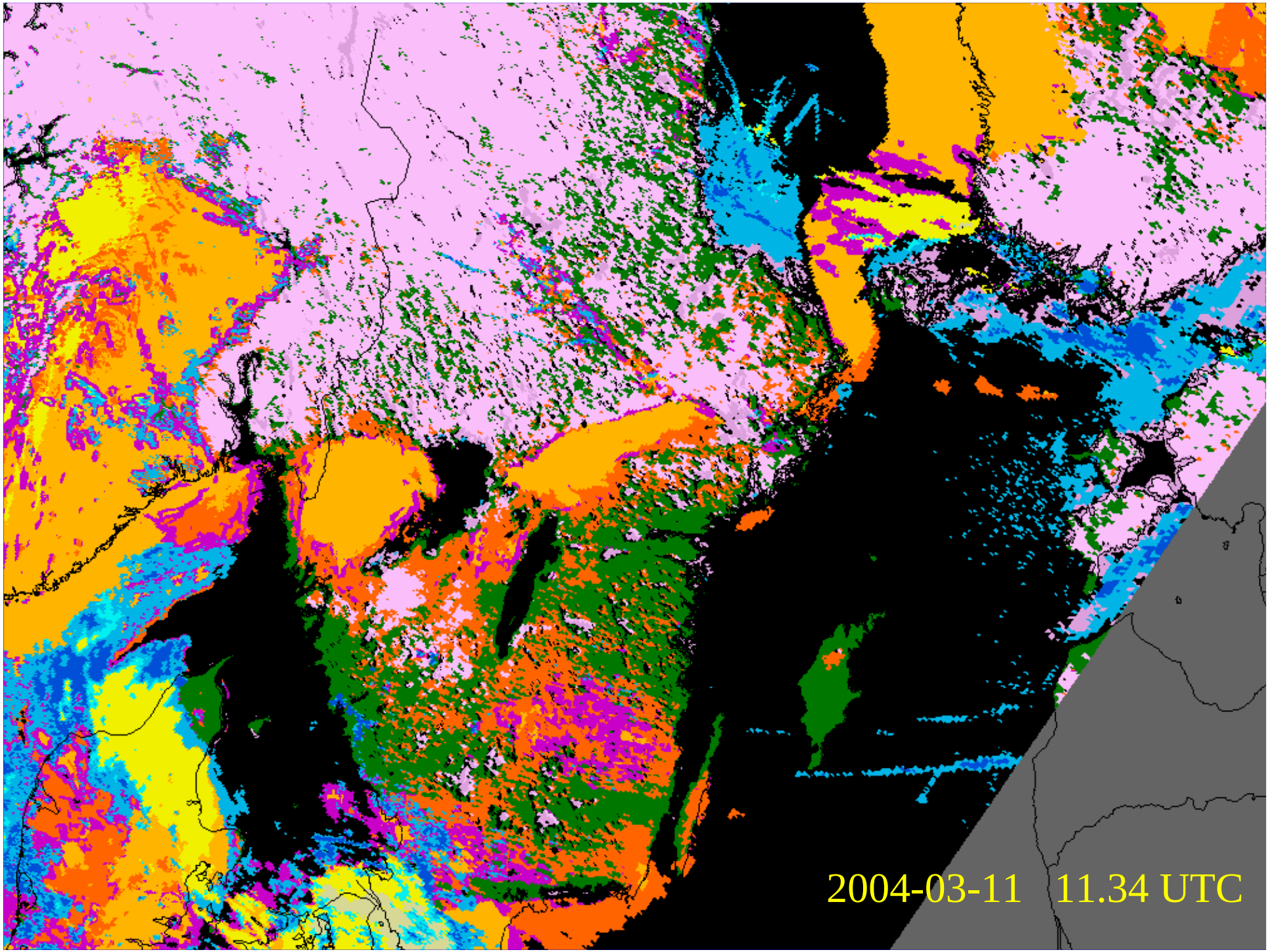

2004-01-23 Sondering Frösön 06 UTC (Red), HIRLAM 00+6 (black)

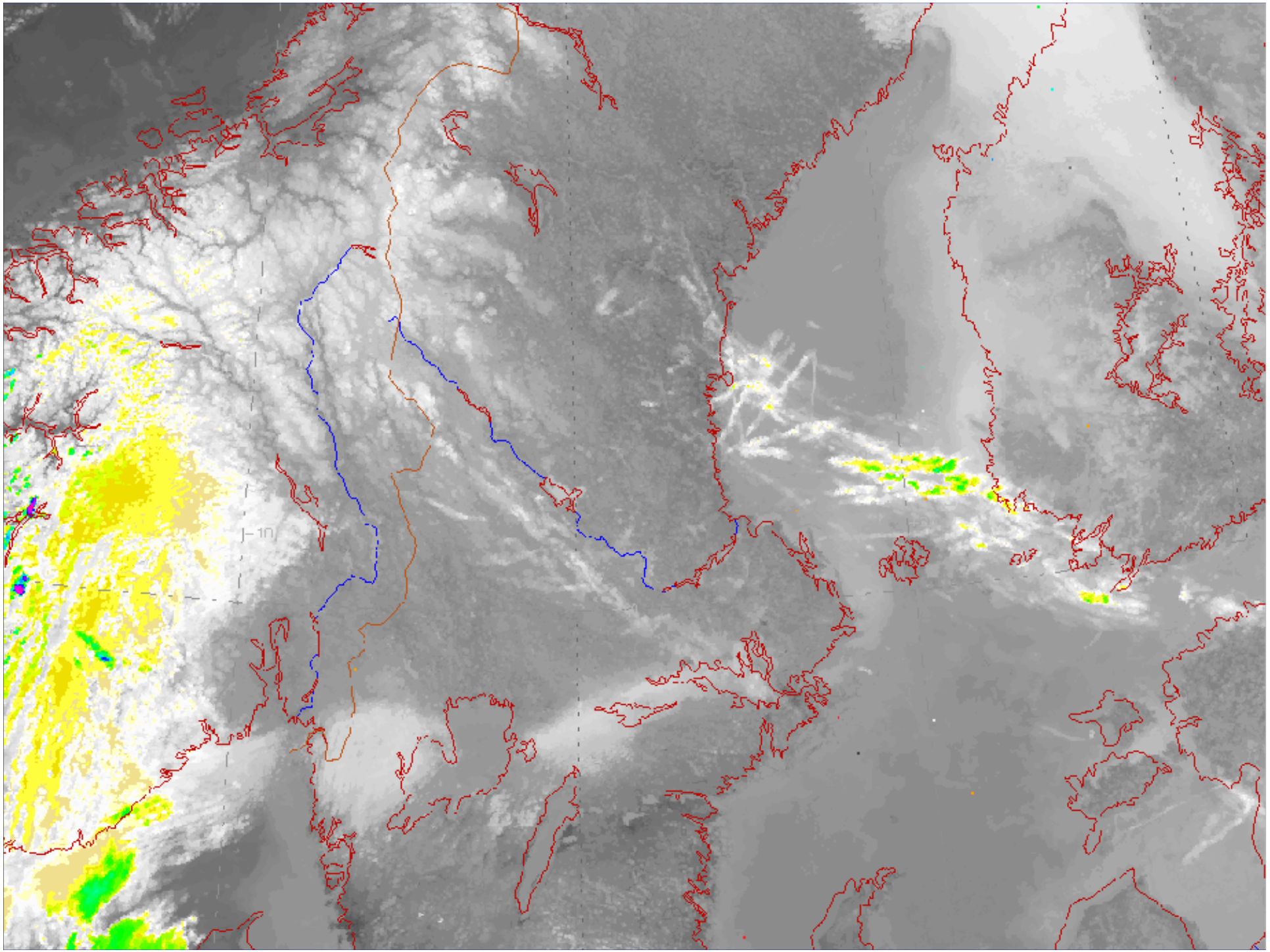


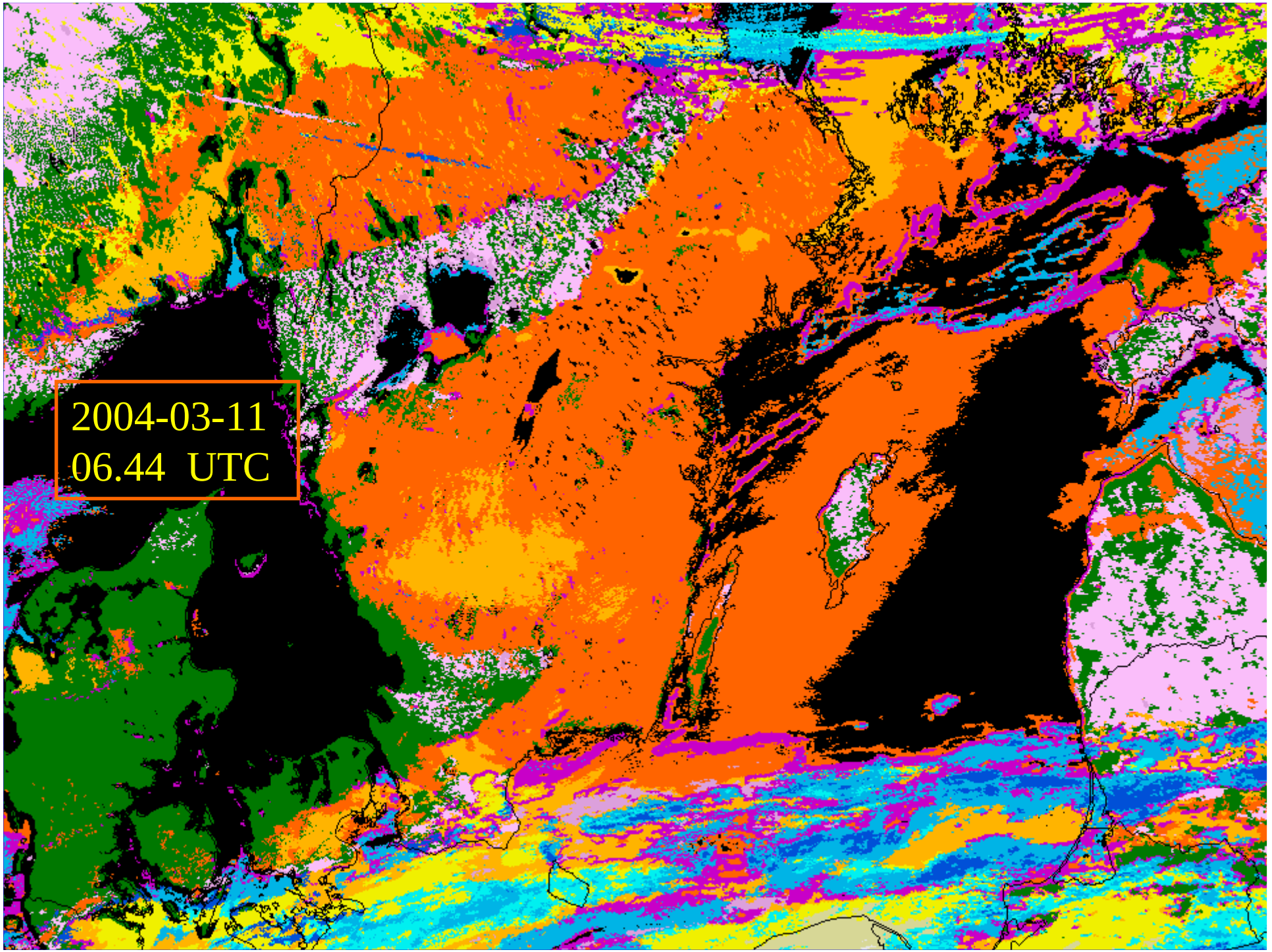
2003-10-06 06.21 UTC

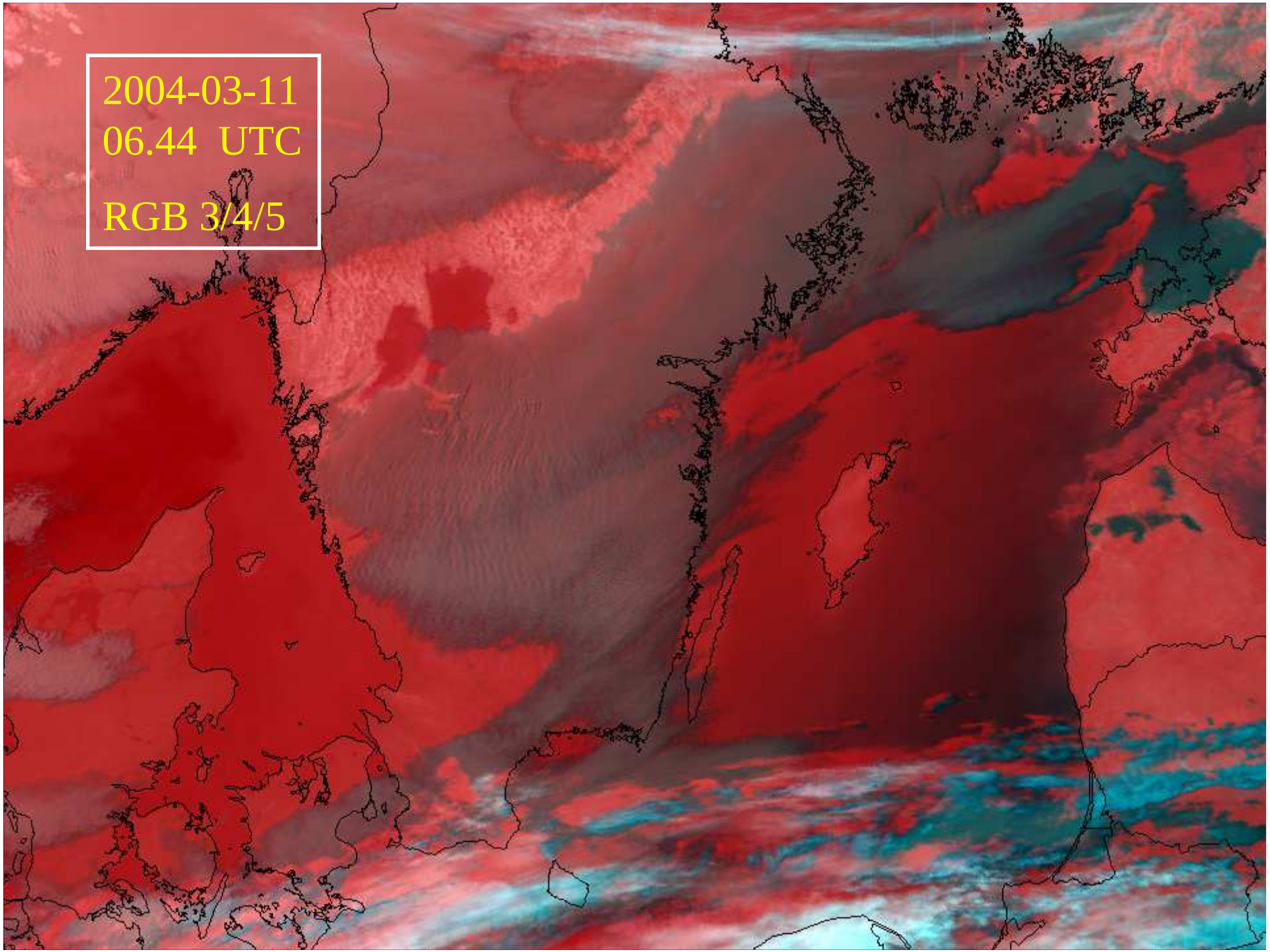


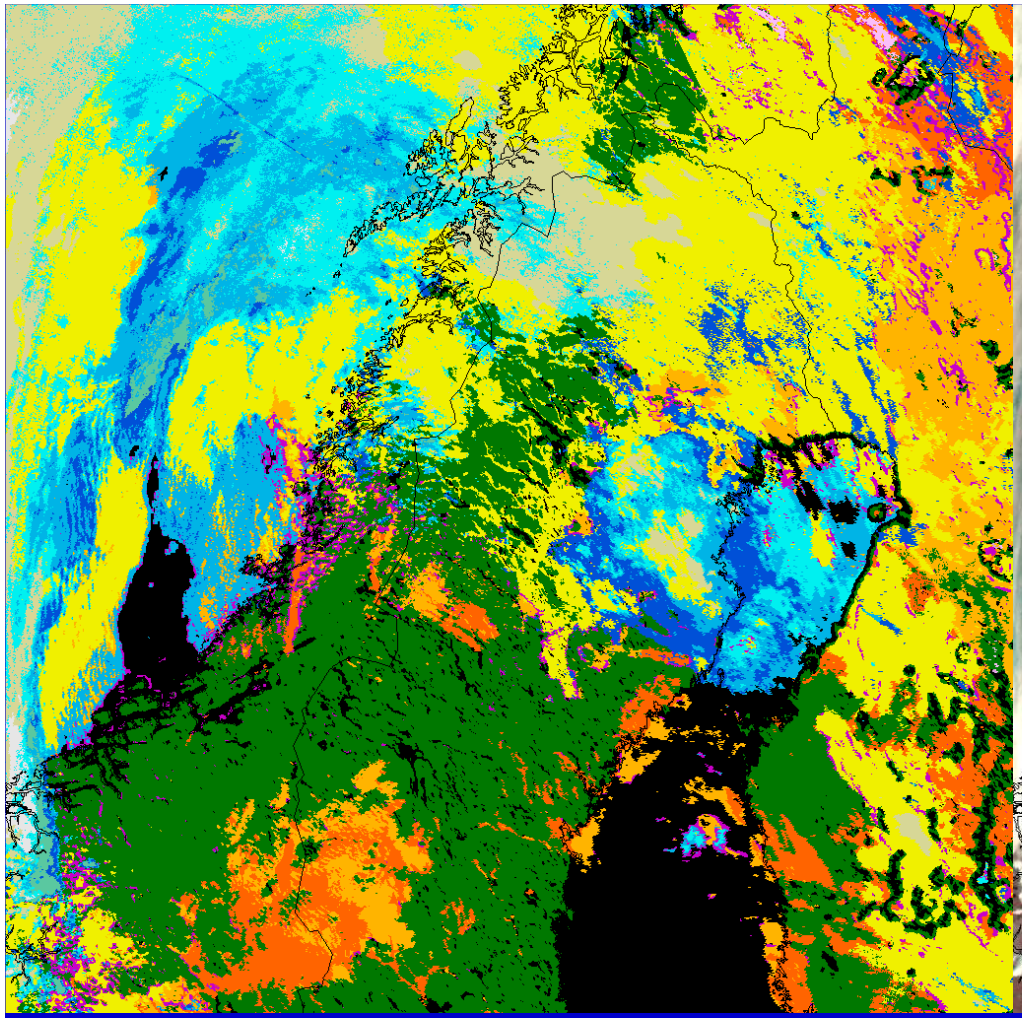

2003-09-24
01.54 UTC

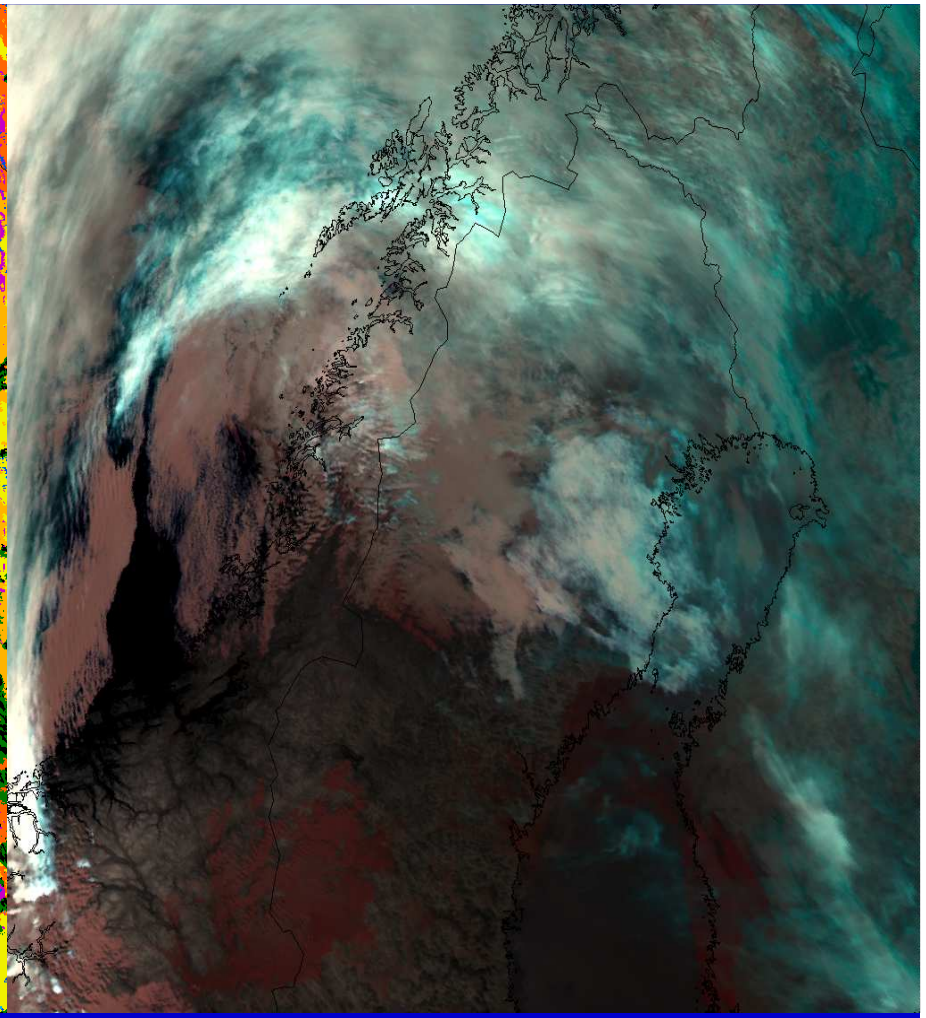

2004-03-11 11.34 UTC




2004-03-11
06.44 UTC


2004-03-11
06.44 UTC
RGB 3/4/5





**2004-04-16** **03.23 UTC**

# Conclusions CT

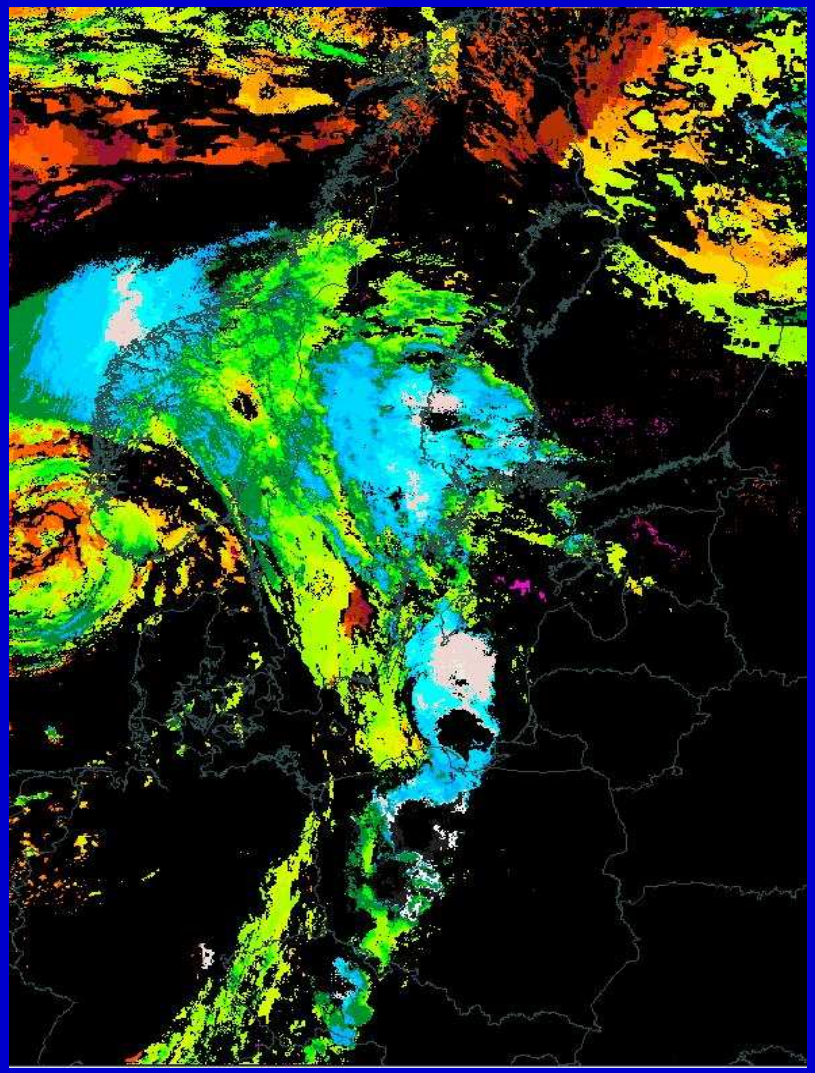
-

- Problems when thin Ci or mist
- In some cases St as As
- Artic air mass over N.Sea → fine Cu classified as Ci
- Difficult during low sun angles
- Want snow at night
- Low clouds and snow patches → messy image

+

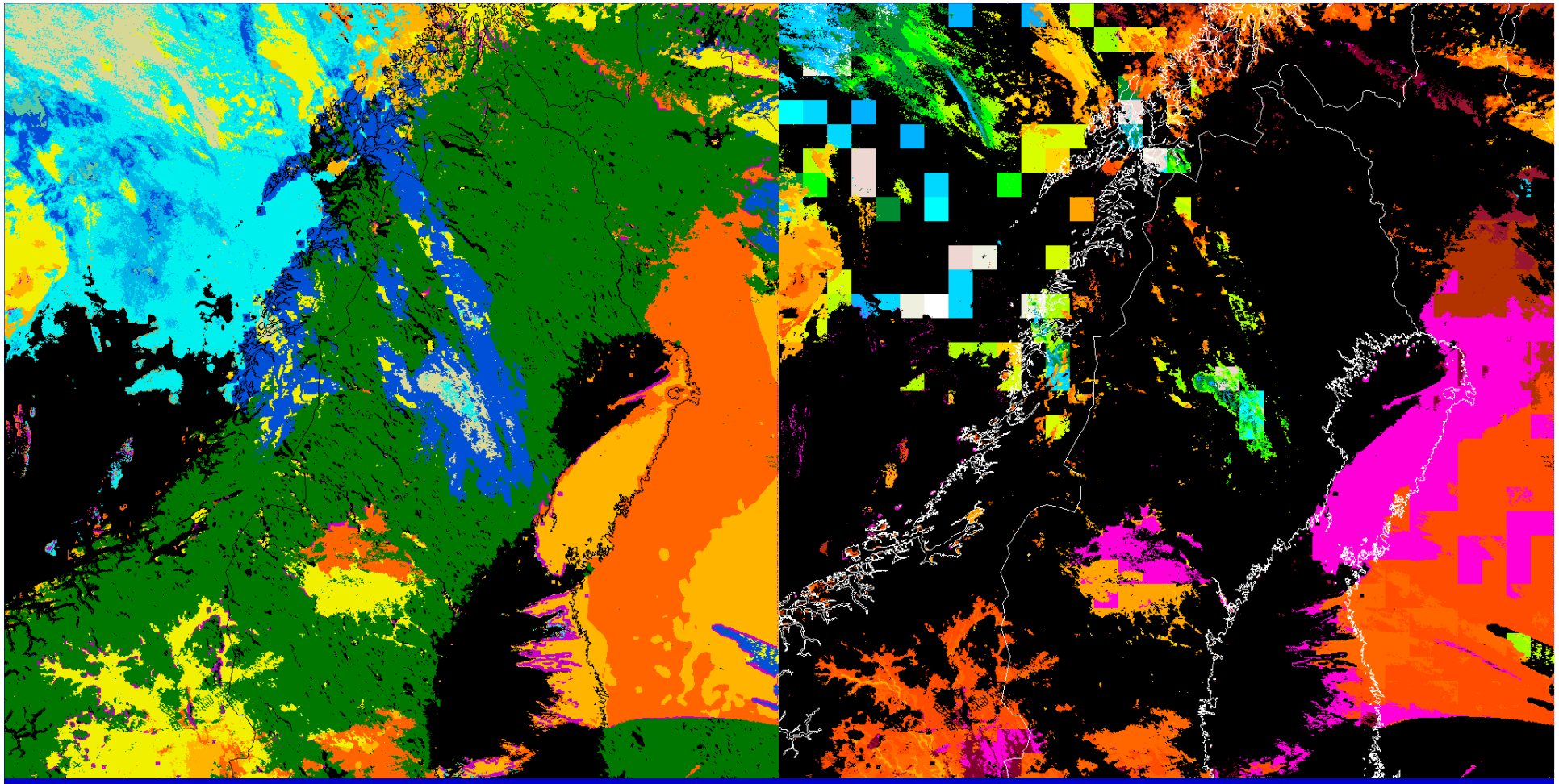
- Low clouds over sea
- Gives thickness of Ci
- Manage clear areas in cold situations (established inversion) Rare confusions with middle height clouds
- Overall impression, perspicuity

# CTTH



**Averaged**
**marks**
# Cloud Top Temperature and Height

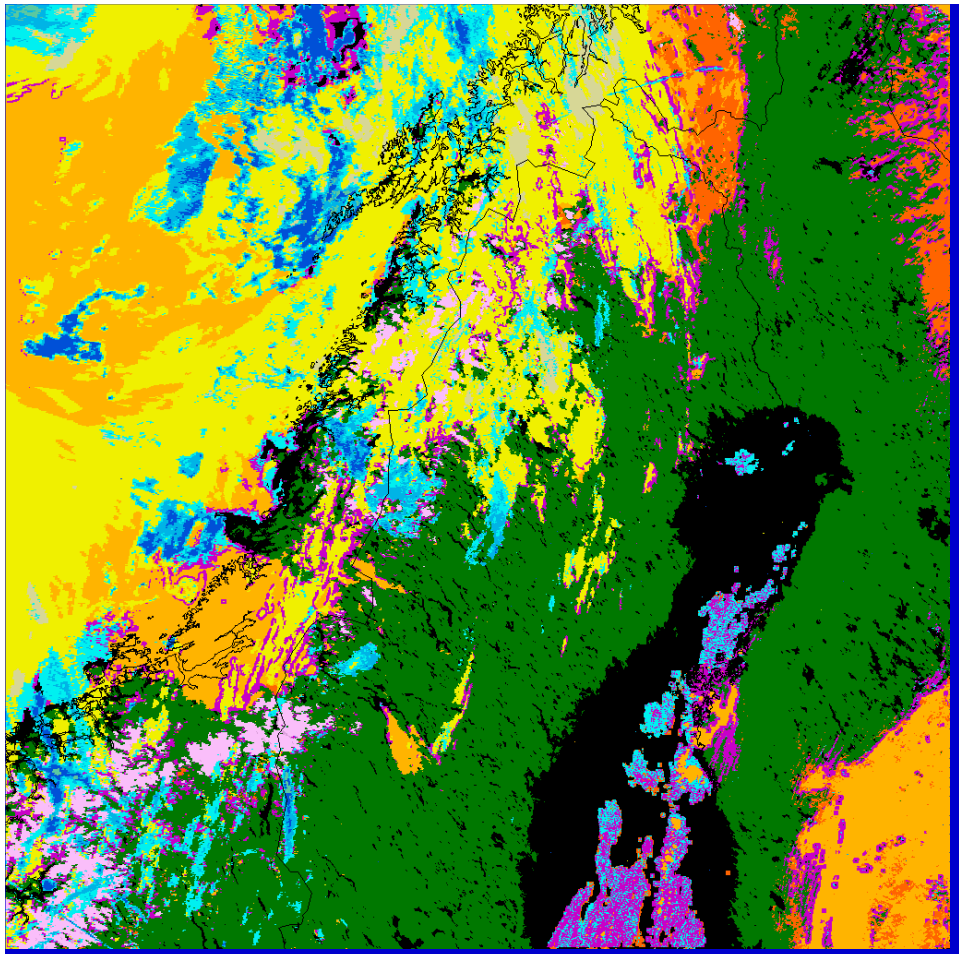
| | |
|---|---|
| **Cloud Top** | **2.6** |
| **Accuracy** | **2.5** |
| **Add unique (and specific) information** | **2.4** |

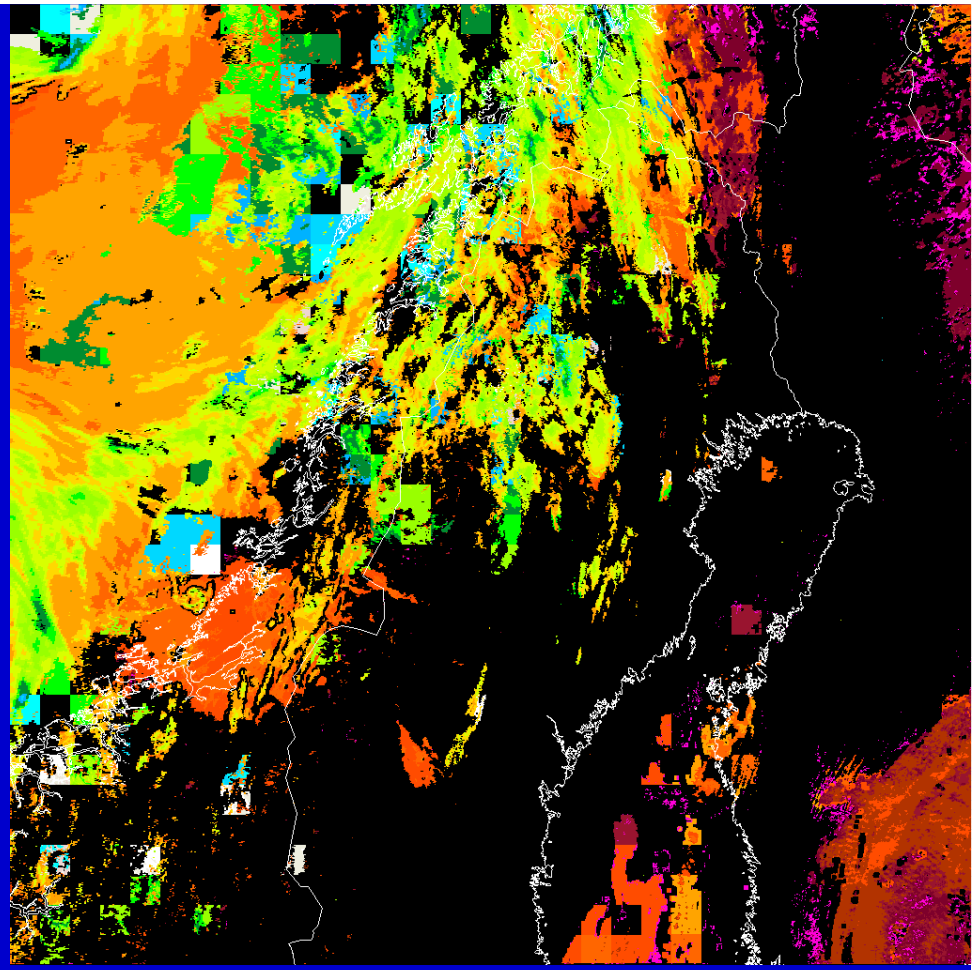


**2003-11-13 02.32 UTC**

**CTTH → 3000-3500m**

**QBC → 500m GND**

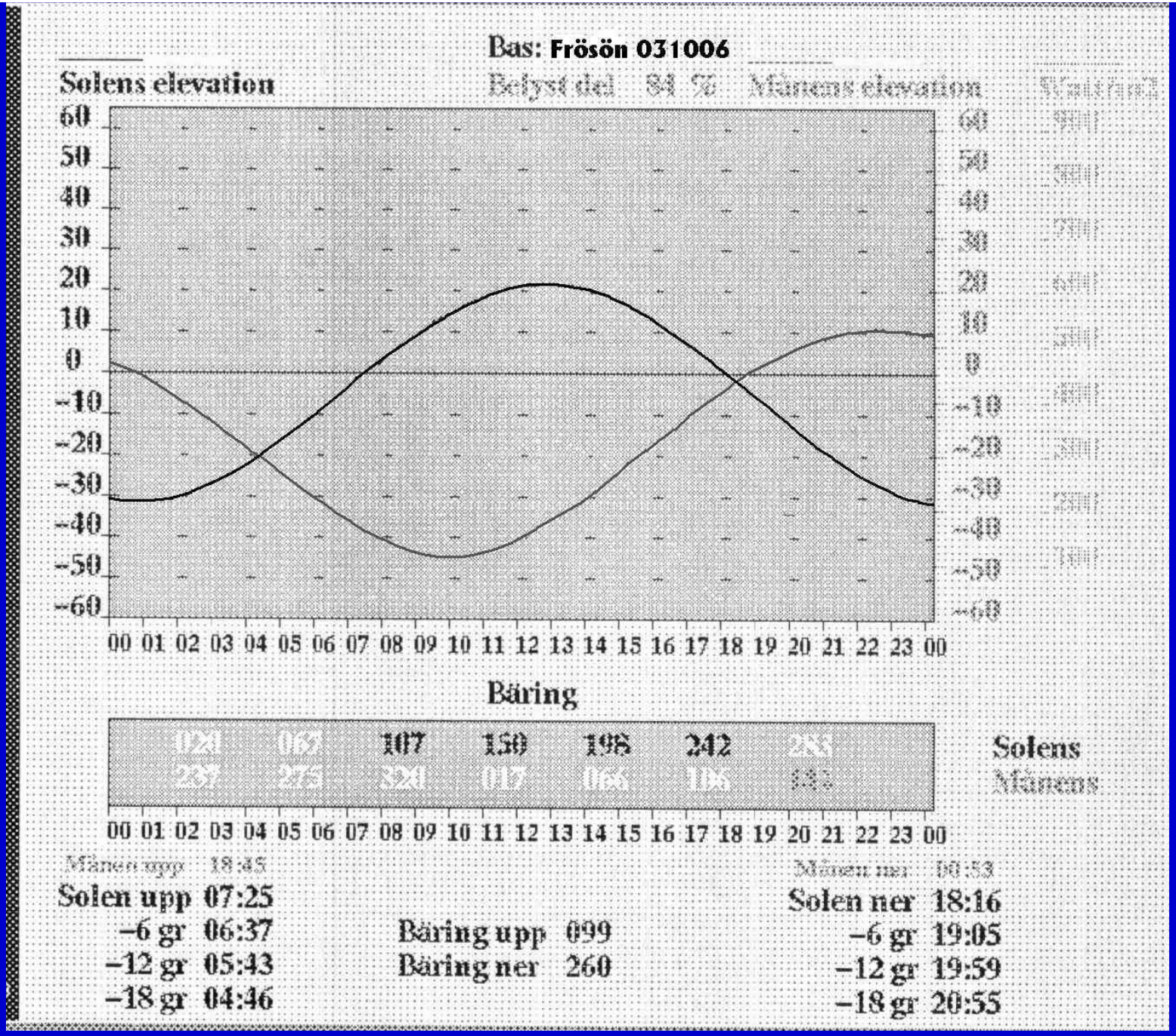




**2003-10-14 09.30 UTC**

**CT ➔ St ~ correct**

**CTTH ➔ 2500-3000m = Too high!**




Swedish summer time

# Conclusions CTTH

\-

- Often too high cloud tops for Stratus
- Accuracy below 4000 m
- Difficult to separate the colours, and the coast lines.

\+

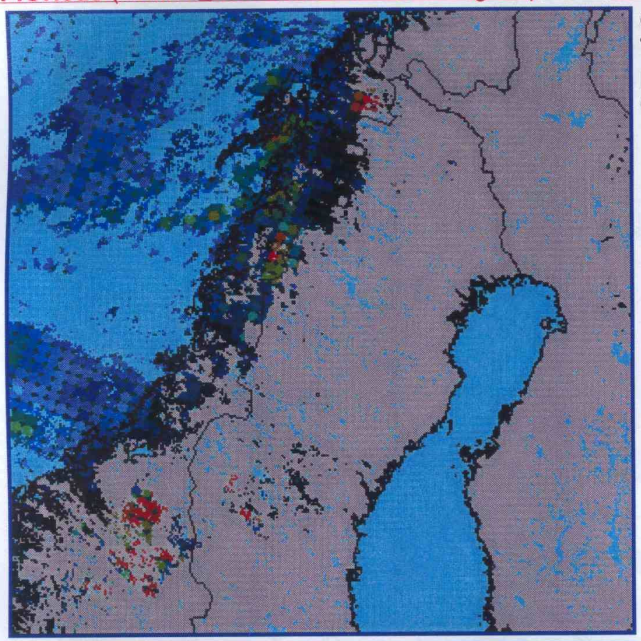
- Saves a little work
- More accurate than MESAN cloud top
- Add information where soundings are not available

# Averaged marks for Precipitating Clouds

| | |
|---|---|
| **Precipitation / NO Precipitation?** | **2,8** |
| **INTENSITY** | **2.9** |
| **VALUABLE INFORMATION?** | **2.6** |

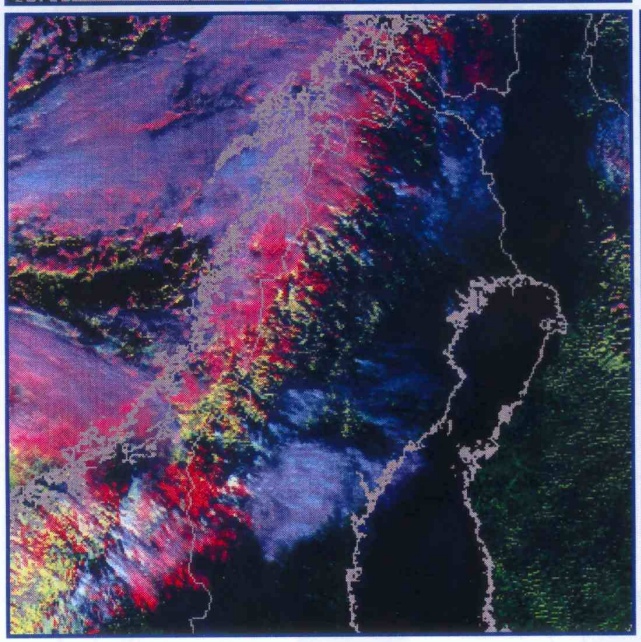
# noaa17-06496/nswe: 2003-9-24 10:22 UTC

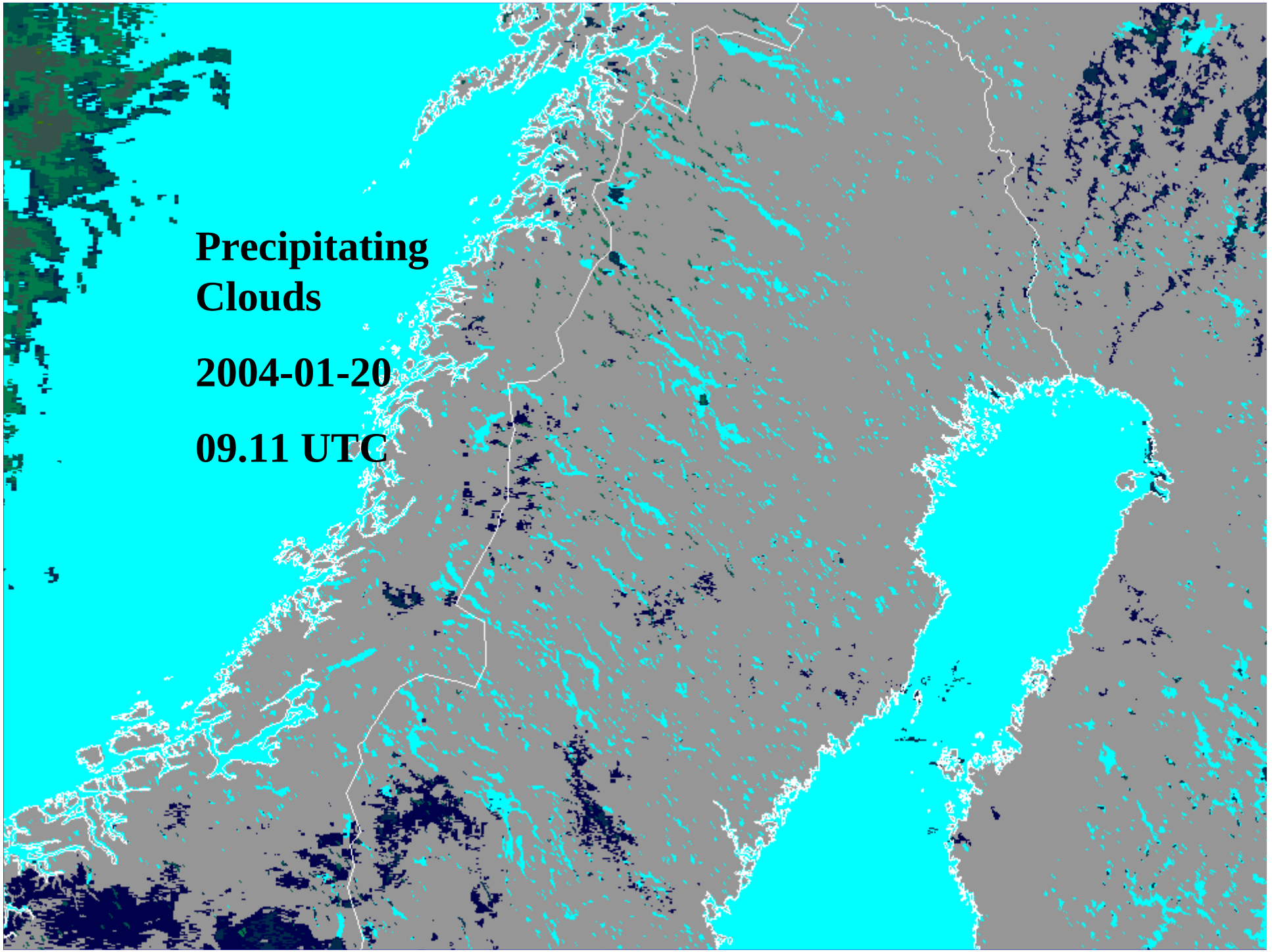
**Previous** (noaa17_20030924_1022_06496.germ) Index **Next** (noaa17_20030924_1022_06496.sswe)



**Colour coding:**
**The image of the precipitating clouds product is created as an RGB colour composite where:**

- **layer 1 (red) is assigned to the probability for precipitation intensity class 3, *intensive precipitation*,**
- **layer 2 (green) is assigned to the probability for precipitation intensity class 2, *light/moderate precipitation*, and**
- **layer 3 (blue) is assigned to the probability for class 1, *risk for precipitation*.**




Precipitating
Clouds
2004-01-20
09.11 UTC

# Conclusions PC

-

- Overdo precipitation in connection with thick middel height clouds.
- Fail precip from St/Sc
- In some cases it overdo the intencity (except cold snow fall)
- Overestimate when a mixture of snow and rain.

+

- Convective precipitation both sea and land
- The intensity in frontal precipitation
- Excellent where there are no radar coverage

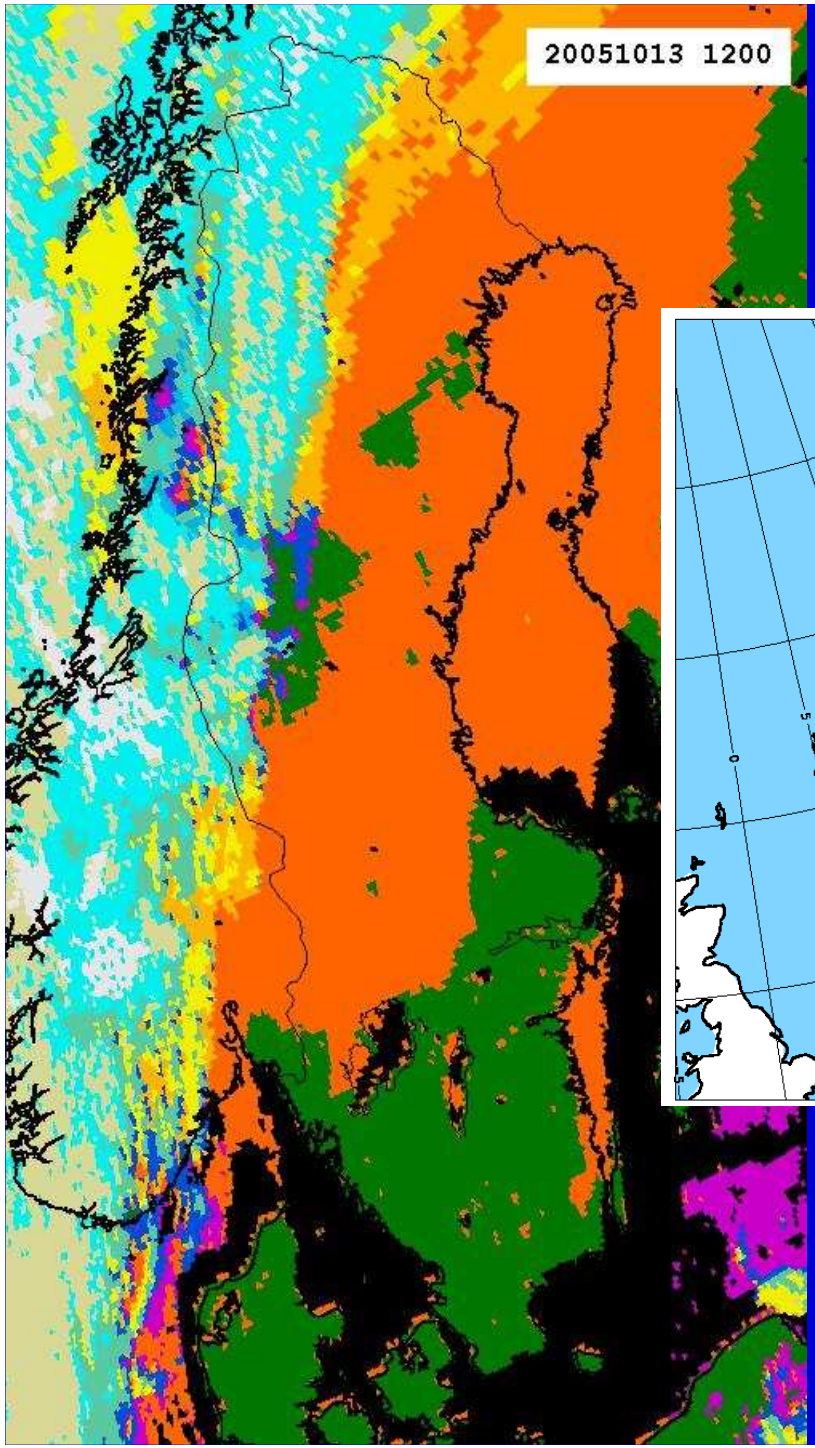
# CONCLUDING REMARKS

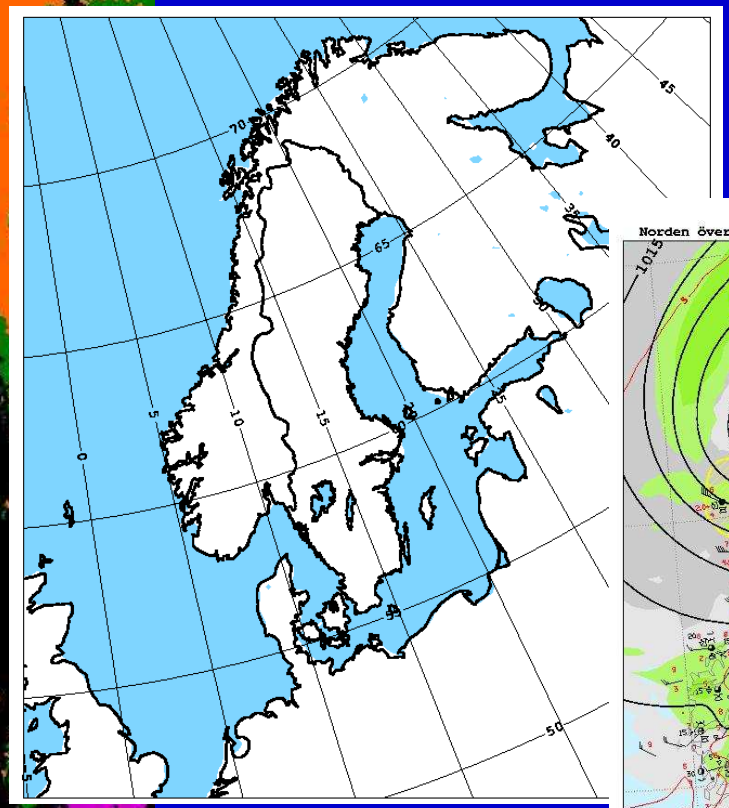
- Generally ACCEPTED results.
- High quality during the summer months.
- Generally slightly underestimation of low clouds in CT, but better than SCANDIA
- Good tool together with other information.

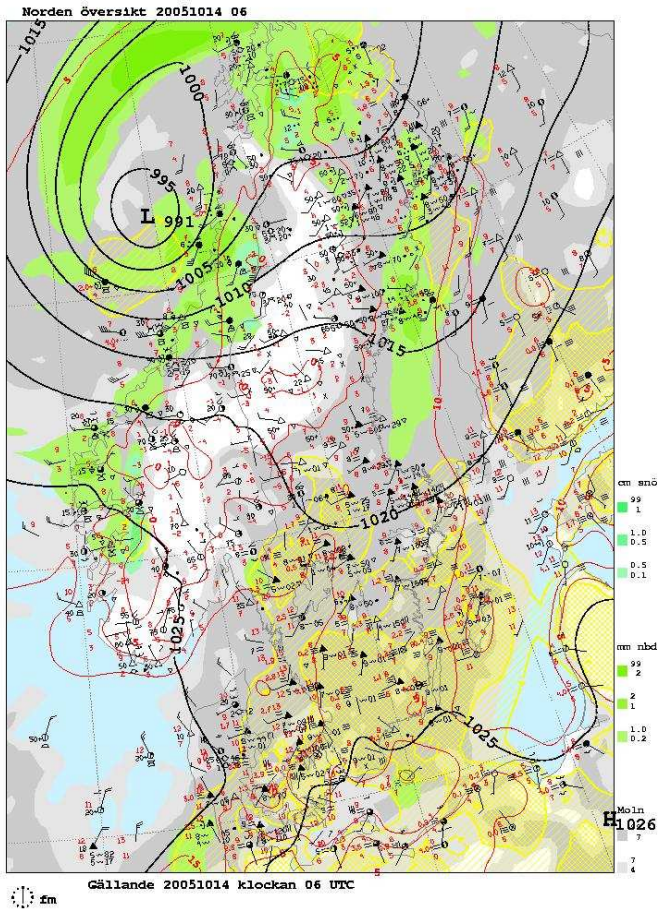
# CONCLUDING REMARKS (cont.)

- Knowledge and experience improve the evaluation results.
- Extend PC to a product over Norwegian Sea and North Sea.
- Important to know weaknesses (low sun, new inversion, mist etc.)
  Inform when operational introduced.

# The Mesoscale Analysis
# MESAN



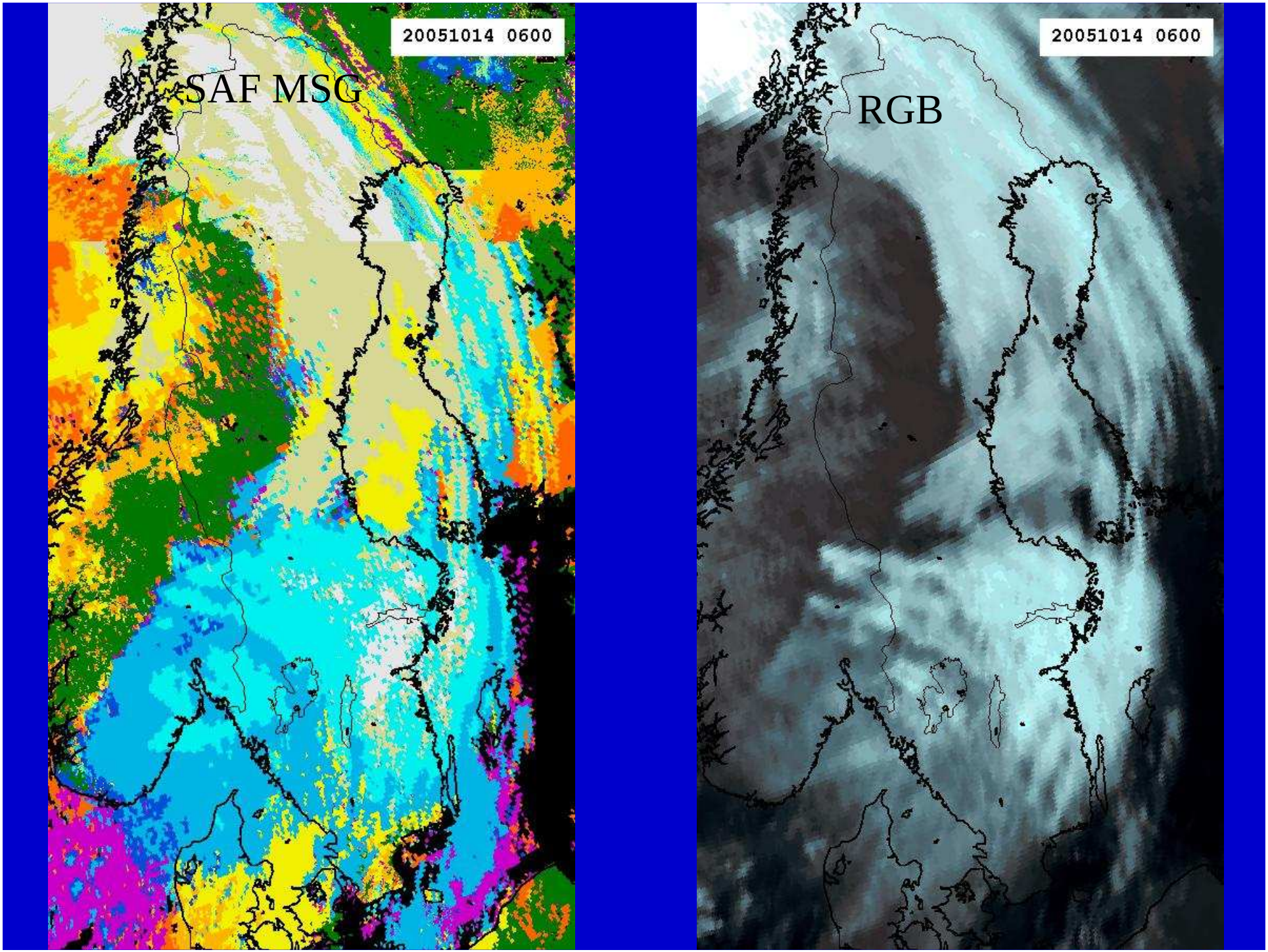


# METHOD

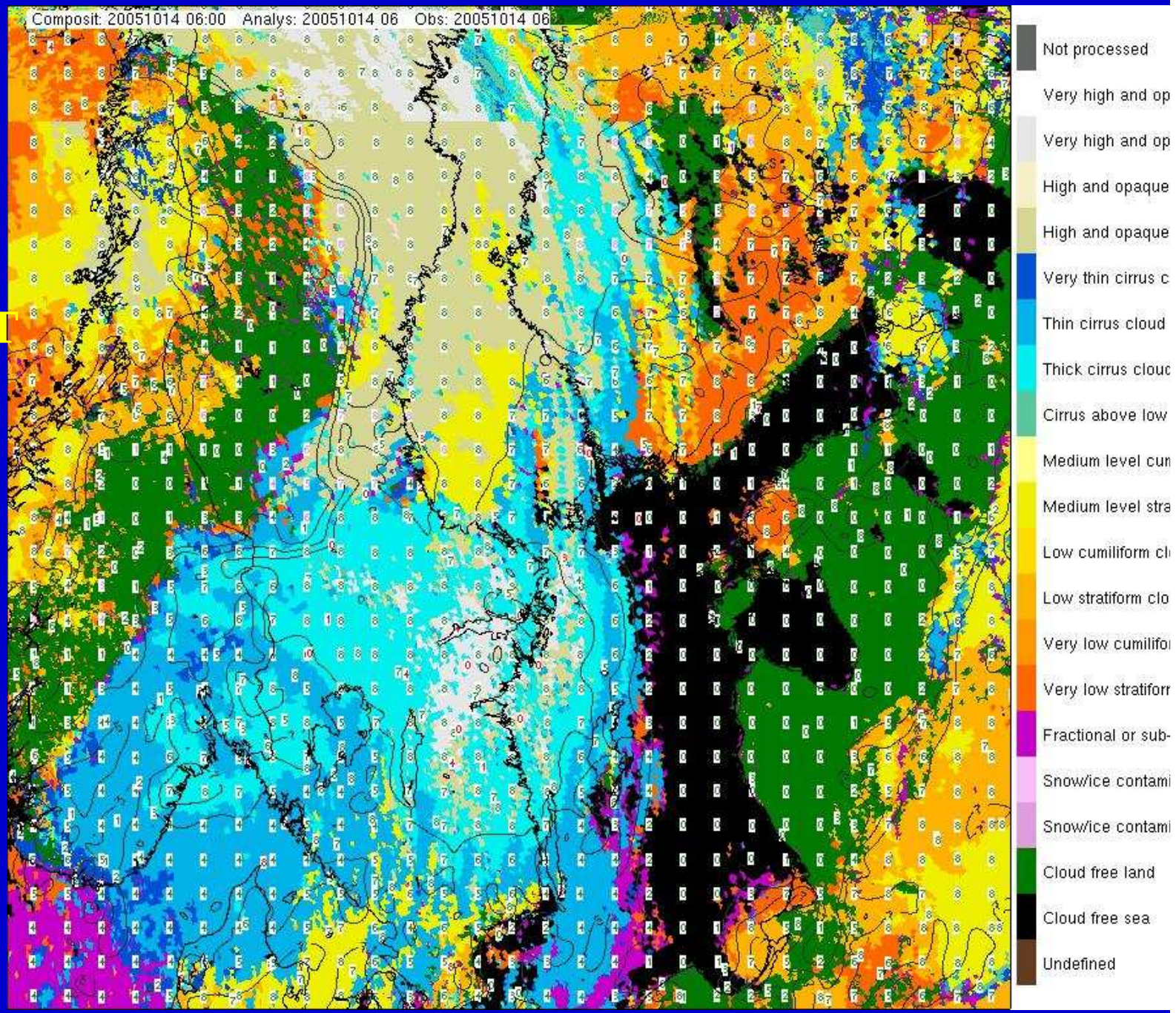
- CT composit (weighting factor and quality flag)

- Superobservation (to match MESAN's spatial resolution)
  A generalized observation through smoothing high resolution data in space.
  Total cloud cover superobservation consider all cloud types.

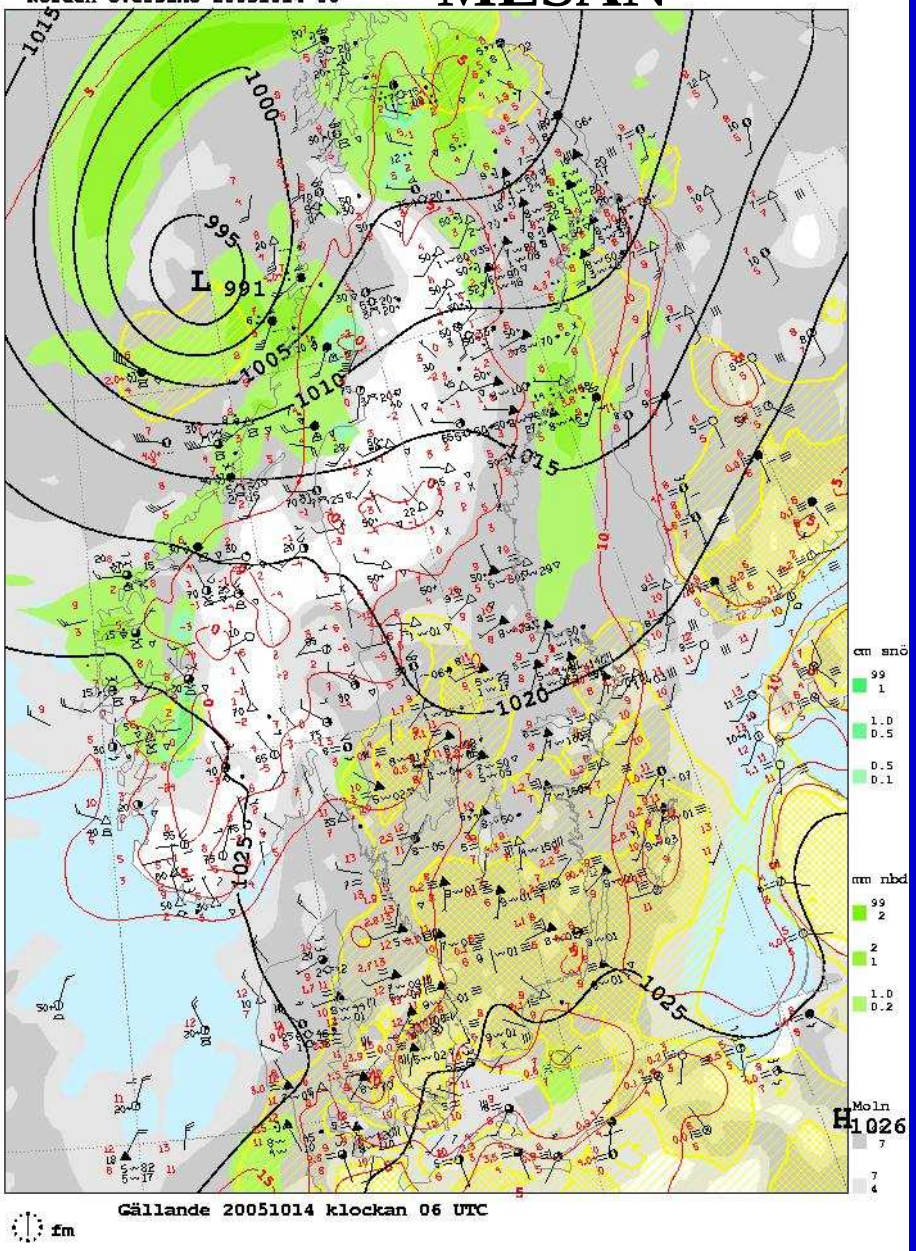
- A validation study for the new cloud cover analysis.
  Verified against Manned SYNOP stations and validated against MESAN with the old SCANDIA classification.


20051014 0600
SAF MSG
20051014 0600
RGB

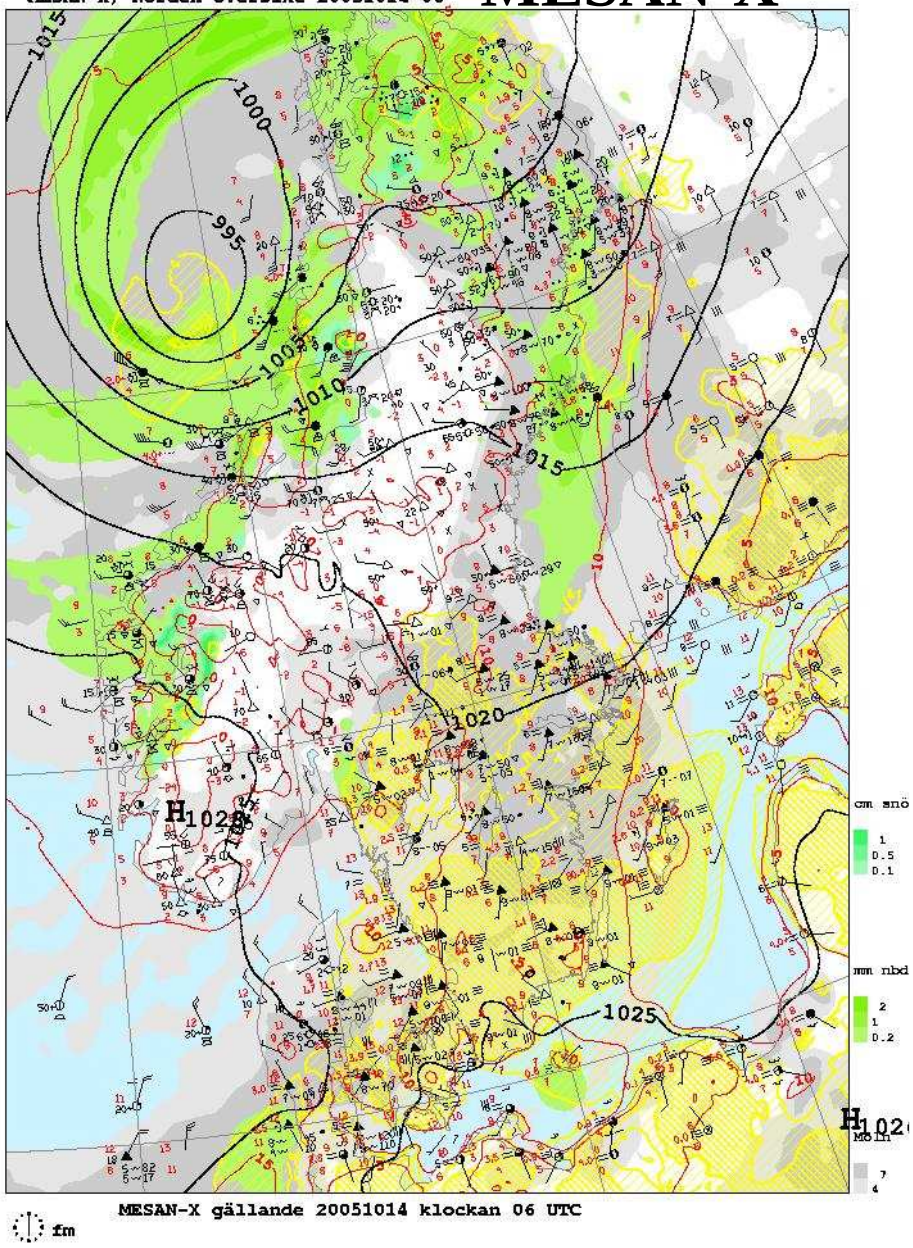
**MESAN-X COMPOSIT TO SUPER-OBS**



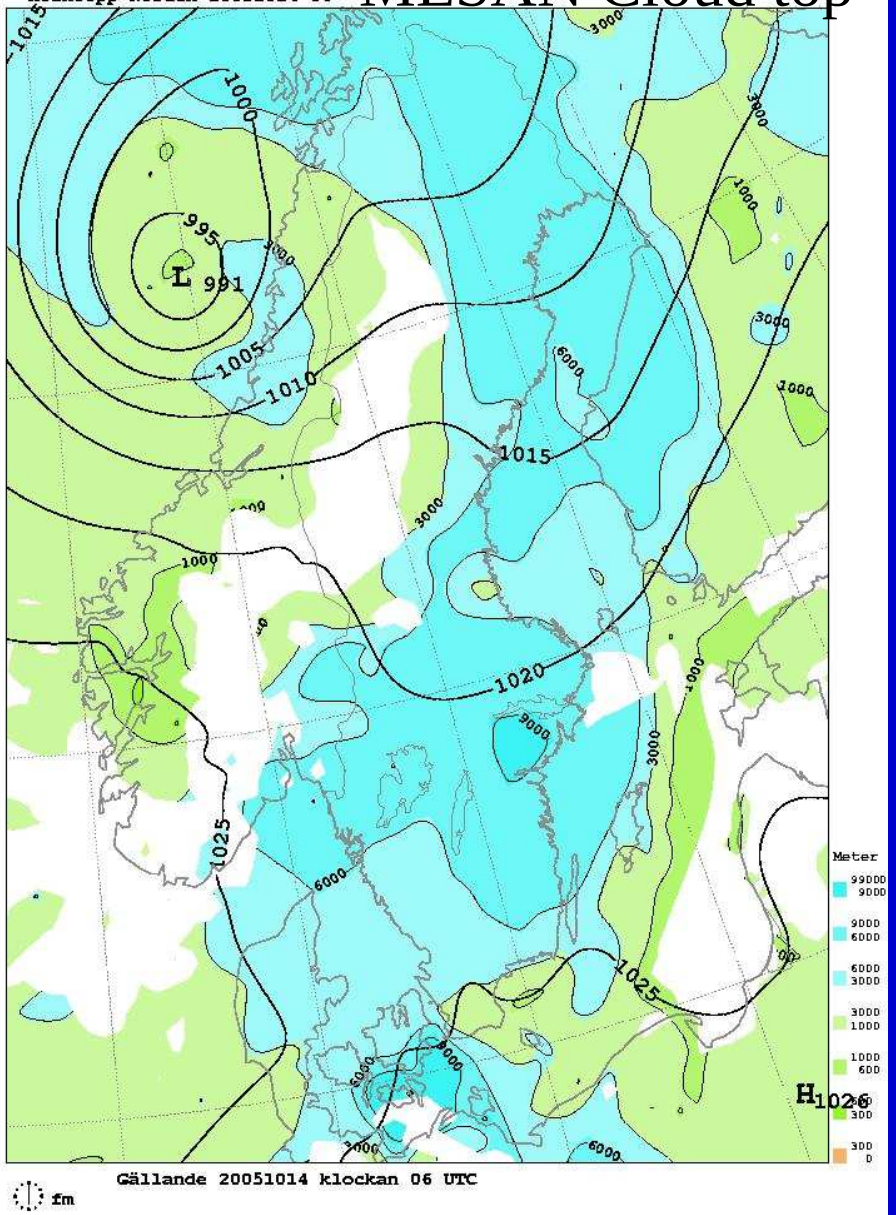
# MESAN



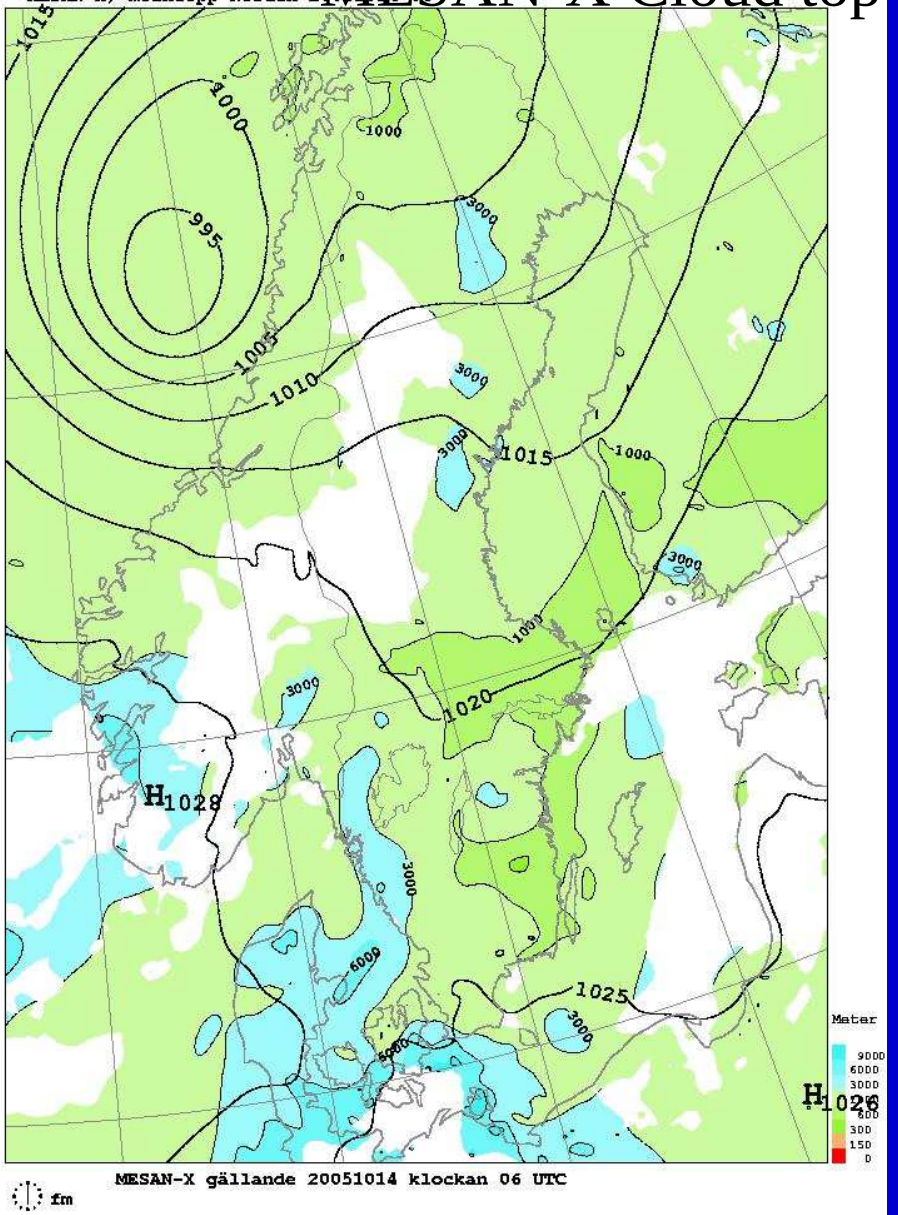

# MESAN-X



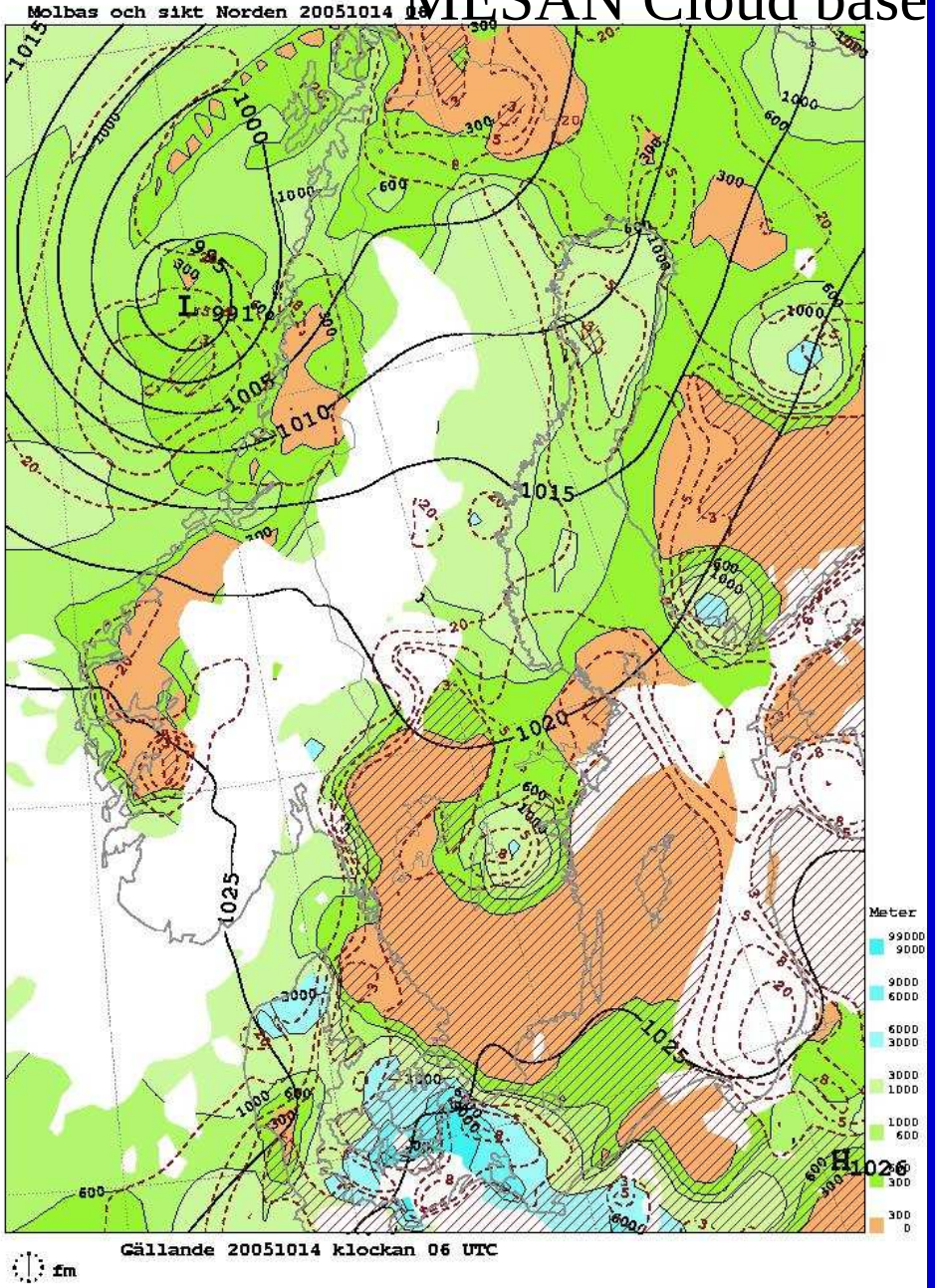
# MESAN Cloud top



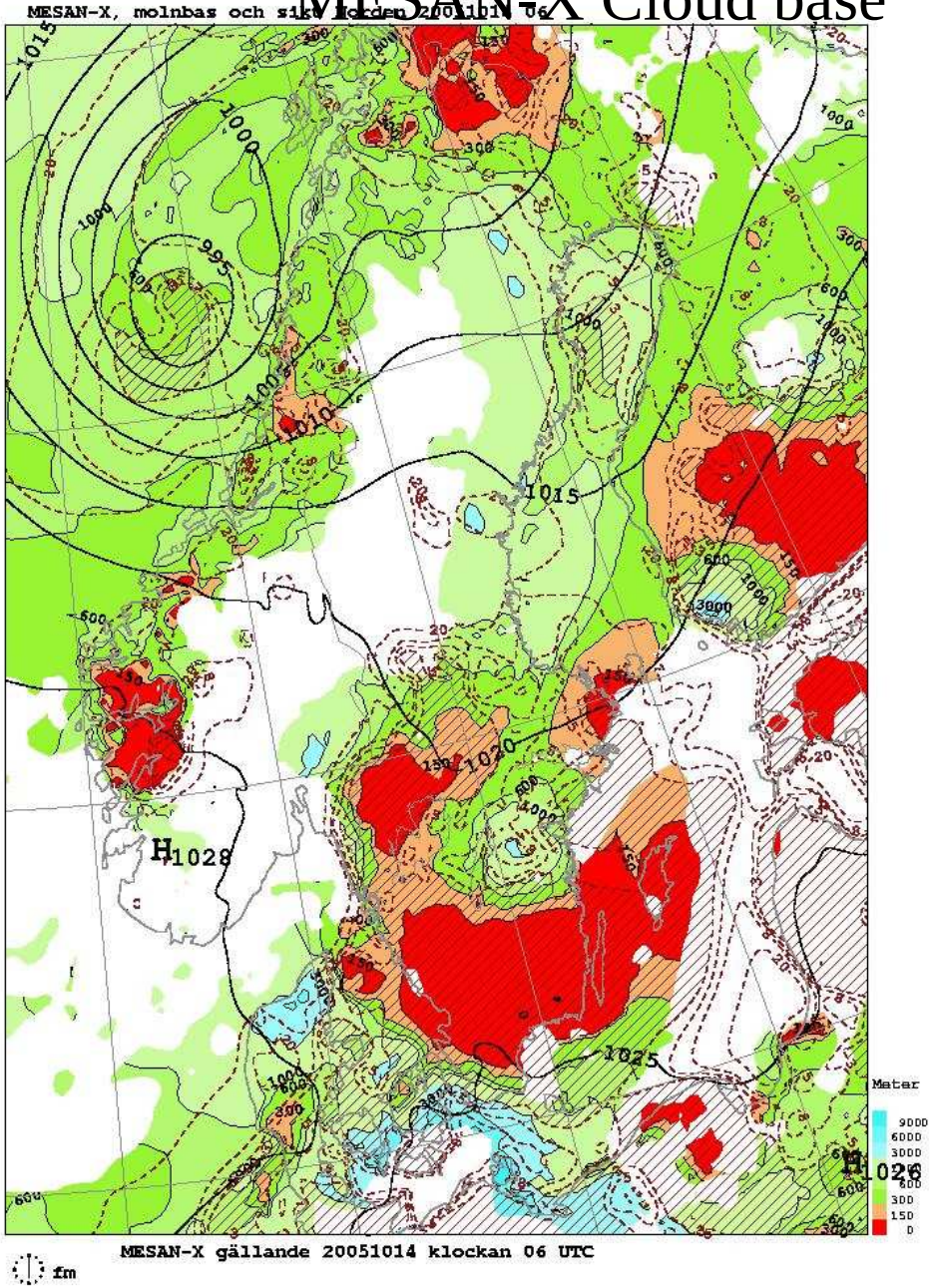

# MESAN-X Cloud top



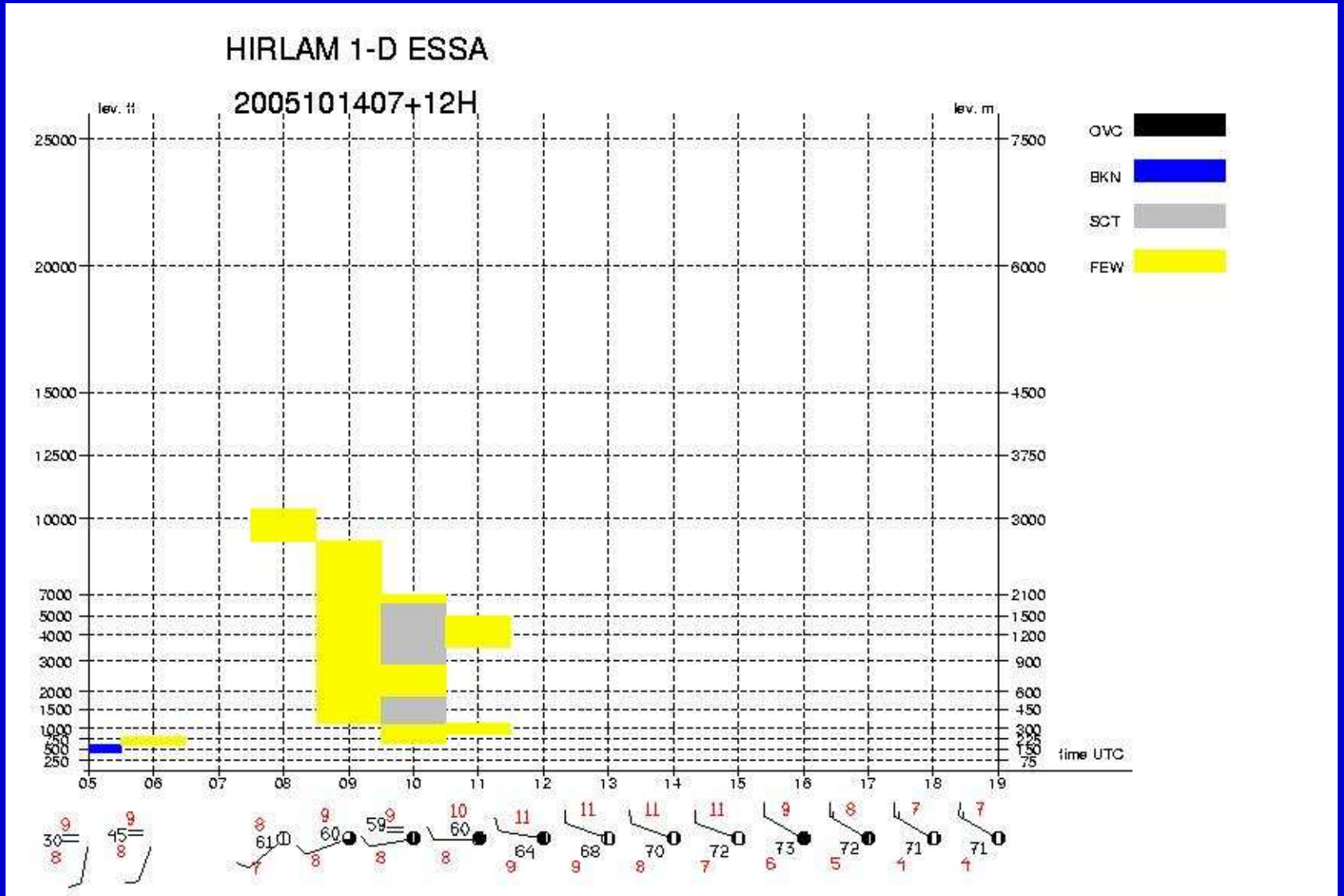
# MESAN Cloud base




# MESAN-X Cloud base



# 1-D HIRLAM


HIRLAM 1-D ESSA
2005101407+12H
lev. ft
lev. m
25000
20000
15000
12500
10000
7000
5000
4000
3000
2000
1500
1000
750
500
250
7500
6000
4500
3750
3000
2100
1500
1200
900
600
450
300
225
150
75
OVC
BKN
SCT
FEW
time UTC
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18
19

# VALIDATIONS and VERIFICATIONS

## against SYNOP observations

## July and December 2004

| | MSCA | MSAF/MN | MSAF/M | MSAF/N |
|---|---|---|---|---|
| Bias | 0.03 | -0.06 | -0.02 | -0.09 |
| Corr. | 0.66 | 0.67 | 0.64 | 0.72 |
| RMSE | 0.26 | 0.28 | 0.28 | 0.28 |

# VALIDATIONS and VERIFICATIONS

# against SYNOP observations

# July 2004

| | MSCA | MSAF/MN | MSAF/M | MSAF/N |
|---|---|---|---|---|
| Bias | 0.03 | -0.03 | 0.00 | -0.05 |
| Corr. | 0.70 | 0.76 | 0.73 | 0.78 |
| RMSE | 0.25 | 0.25 | 0.25 | 0.24 |

# VALIDATIONS and VERIFICATIONS

## against SYNOP observations

## December 2004

| | MSCA | MSAF/MN | MSAF/M | MSAF/N |
|---|---|---|---|---|
| Bias | 0.03 | -0.07 | -0.03 | -0.11 |
| Corr. | 0.58 | 0.58 | 0.57 | 0.62 |
| RMSE | 0.26 | 0.32 | 0.31 | 0.32 |

# CONCLUSIONS

- **Acceptable results in July with both MSG and NOAA data.**
- **The New MESAN performs slightly better than the old one based on SCANDIA.**
- **Works going on to give observations in low sun angle a lower weight.**

# CONCLUSIONS

- **Thin Ci in SAF CT/MSG often classified as thick, better in PPS.**
- **Low clouds over the Baltic Sea not always detected in CT/MSG.**
- **CT/MSG manage thin low clouds during nighttime.**
- **A need for a clearer colour explanation**
- **A suggestion to show more of the flag data on the images**

# FUTURE

- Evaluation of the new MESAN (with the CT and CTTH SAFs) will continue.

- Introduction of the products to all meteorologists.