Royal Netherlands
Meteorological Institute
Ministry of Infrastructure
and Water Management

HARMONIE AROME physics developments

Sander Tijm

Overview

- Dynamics and boundary interpolation (poster Colm)
- Cloud & turbulence studies (presentation Karl-Ivar and this presentation)
- Convection problems
- Microphysics work (presentation Jenny, Karl-Ivar)
- Microphysics – aerosol - radiation (presentation Laura)
- Radiation (poster Emily)
- Aerosols (presentation Daniel)
- Stable boundary layers
- High resolution experiments (presentation Xiaohua, poster Esbjorn)
- Developments MUSC (presentation Eoin)

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Het Parool
Vrij, Onverveerd

HOME AMSTERDAM OPINIE PS STADSGIDS

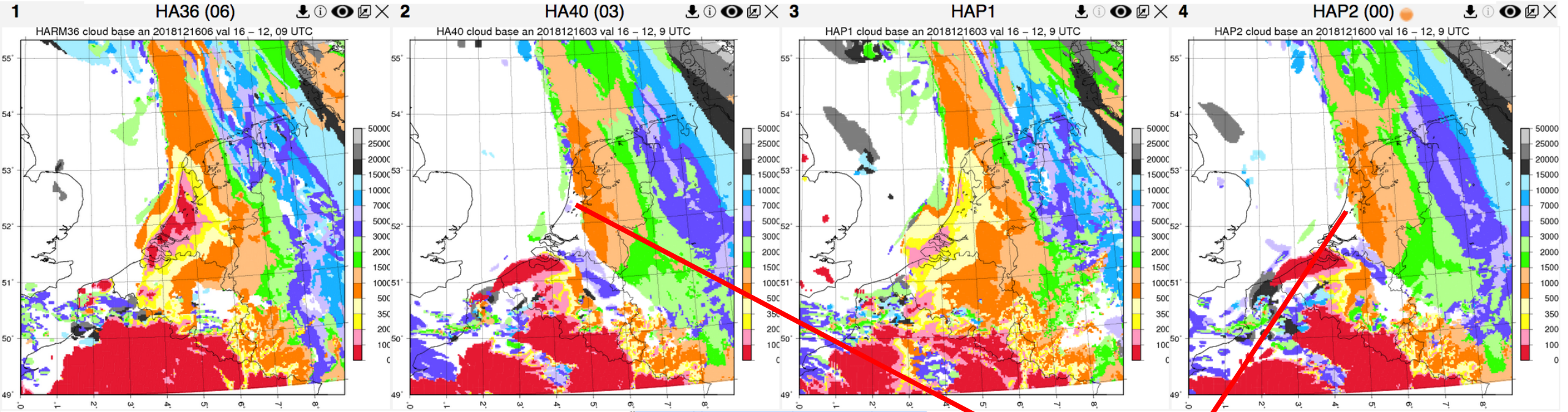
Zeker 100 geannuleerde vluchten op Schiphol

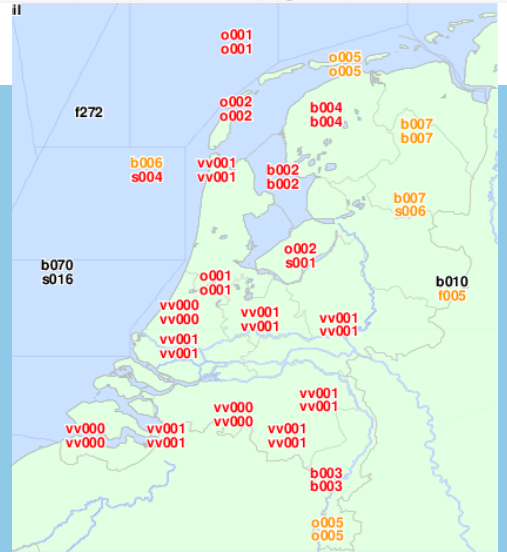
Bad fog forecast:
100 cancelled flights
Sunday 16-12-2018

Damage:
€5.000.000 - €10.000.000

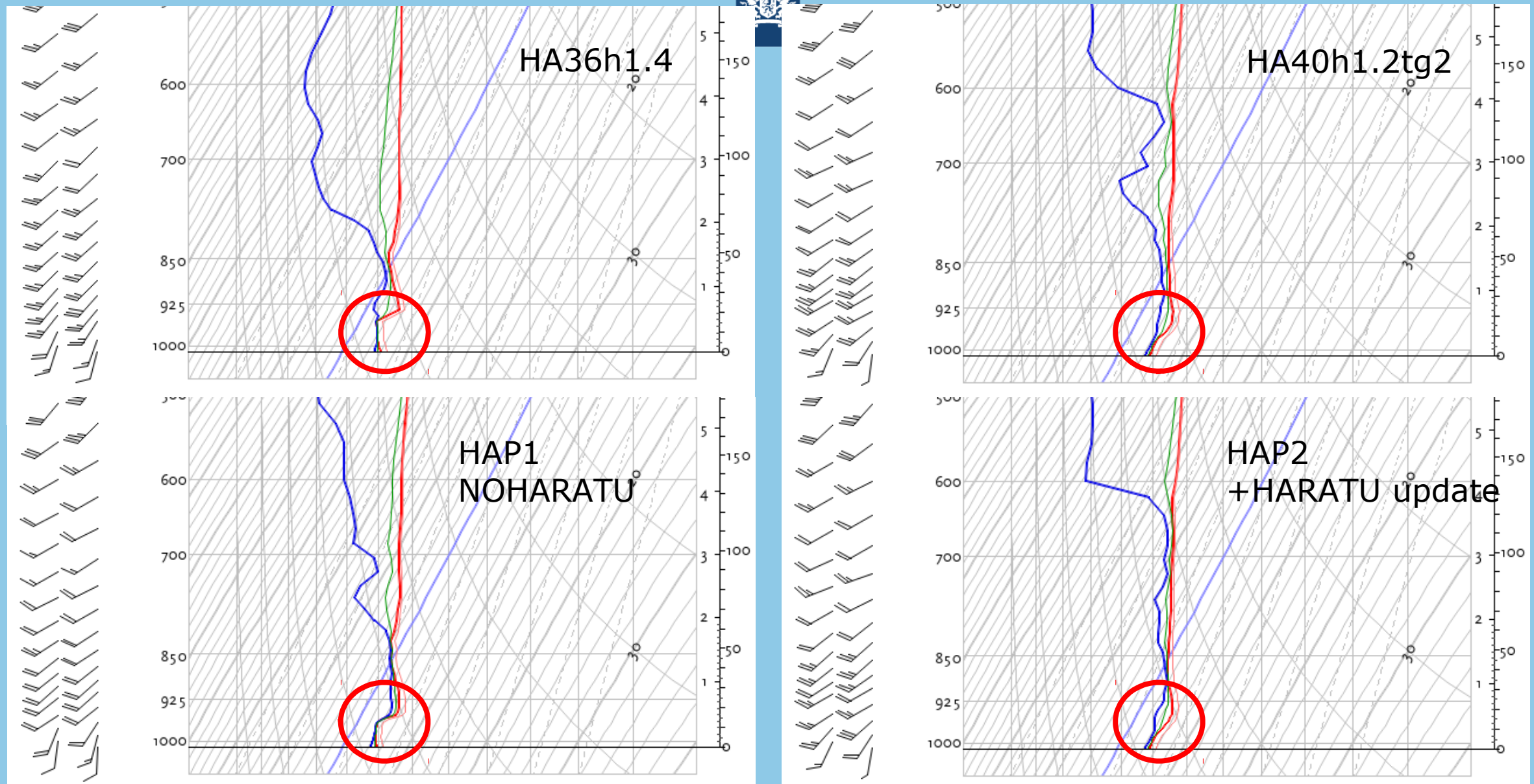
Cloud base forecast

36h1.4 | 40h1.2tg2 | 40h1.2, NOHARATU | 40h1.1.1



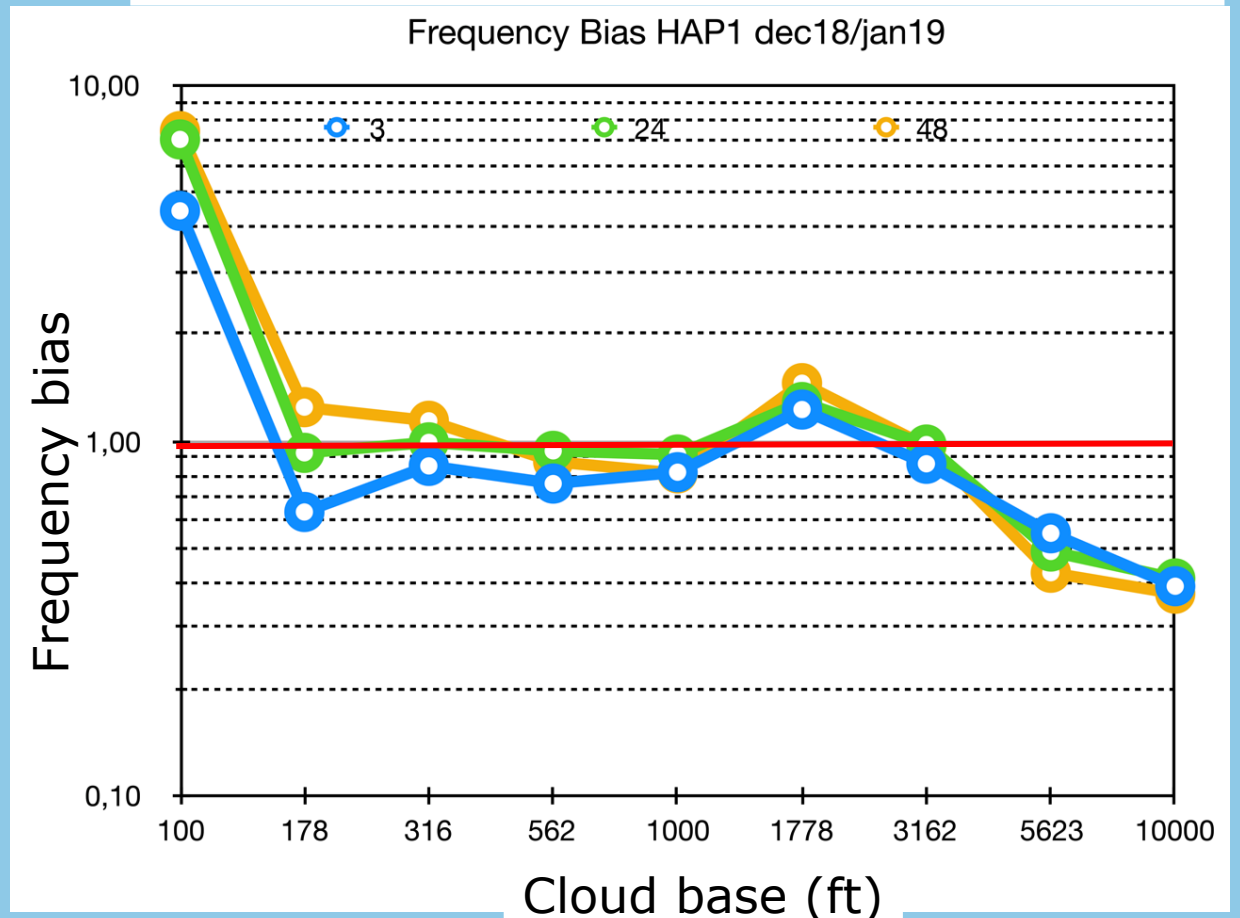


Missing low clouds/fog



Missed stratus caused by mechanical turbulence

40h1.2tg2, NOHARATU
64 122 356 697 1830 1966 3560 3943 595



40h1.1.1
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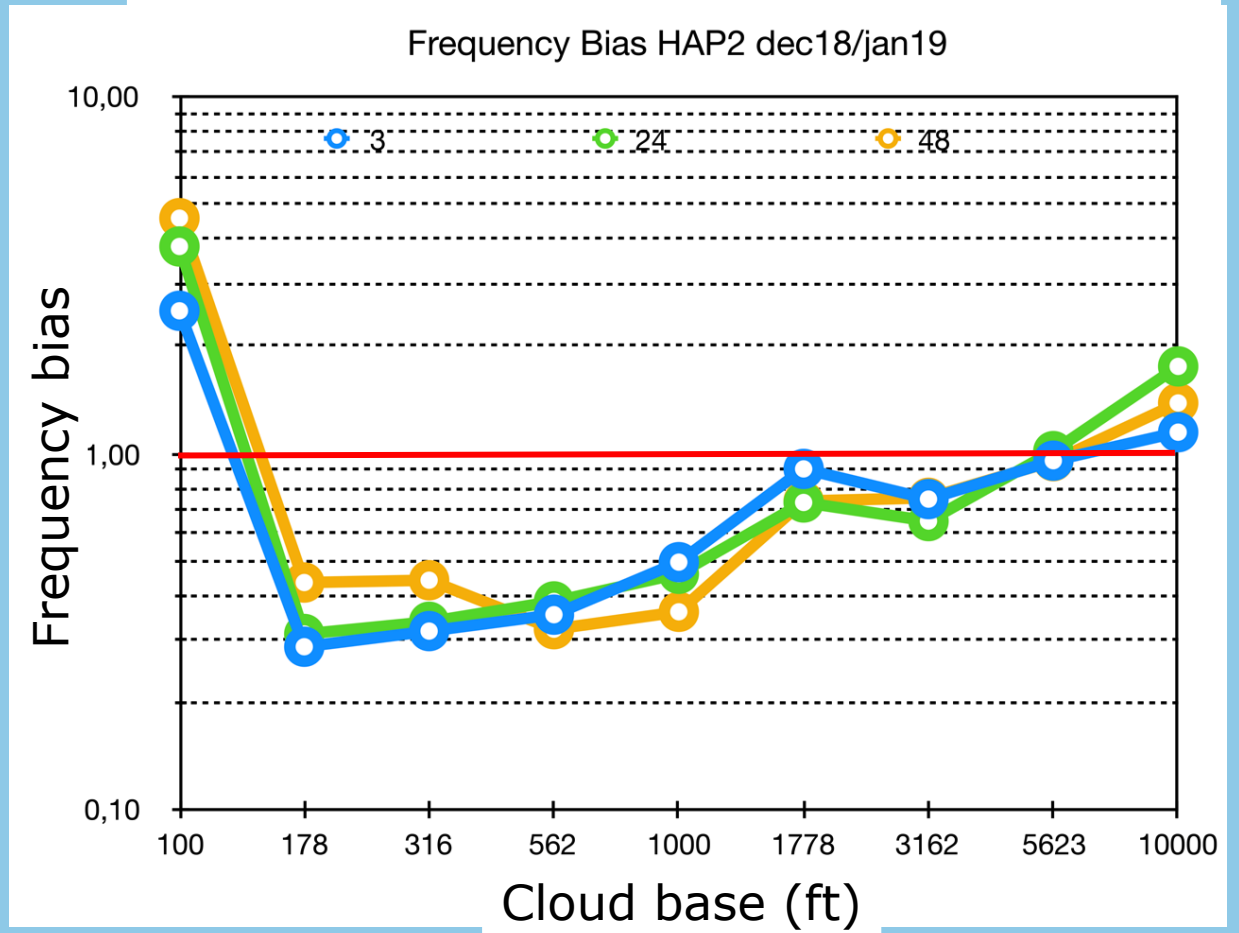
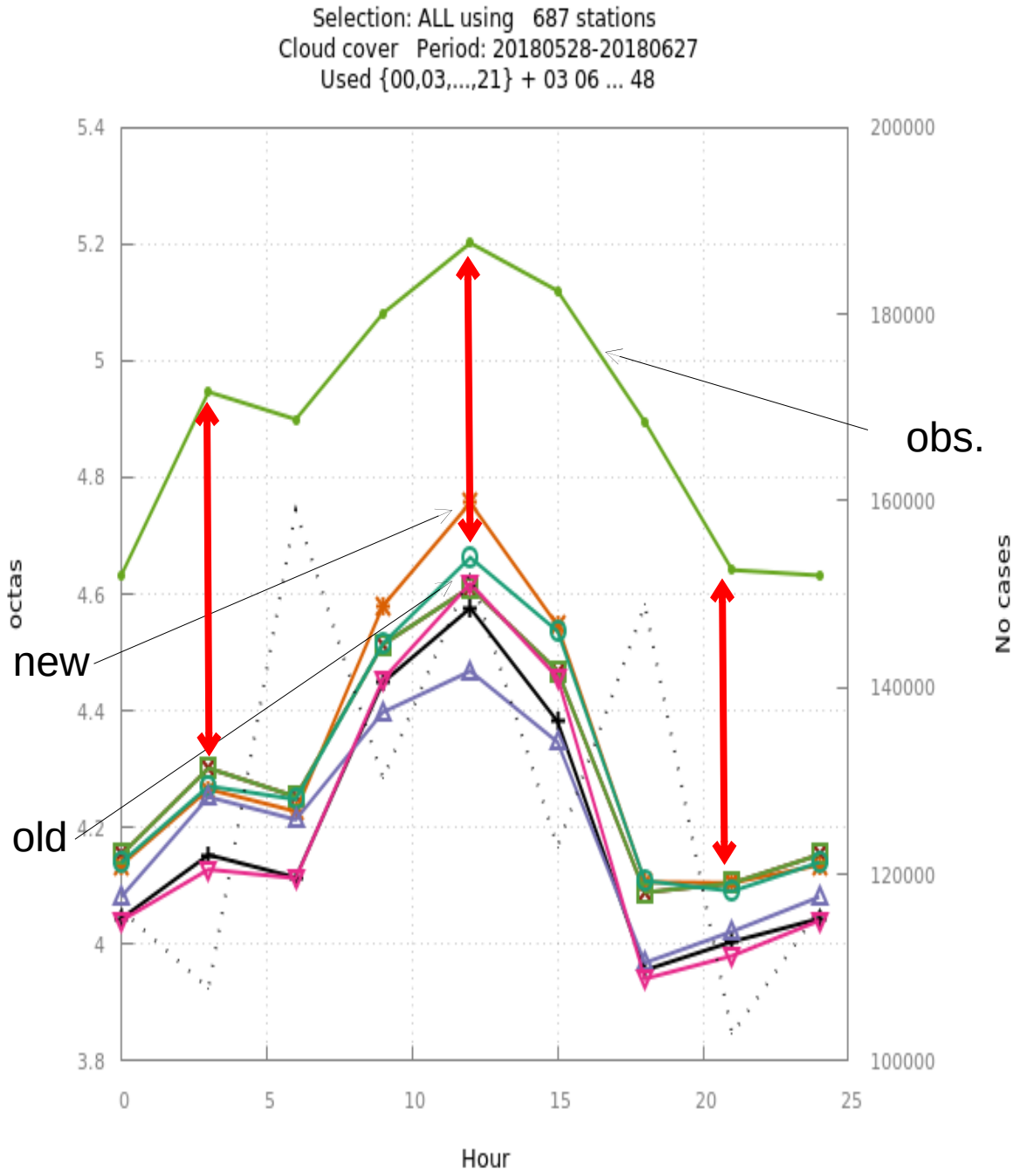


40h1.1.1 only 30-50% of low cloud cases

HARATU update (1)

Wim de Rooy

- Improvement in daily cycle cloud cover
- No impact on the big systematic low cloud bias
- This update will be implemented in HARMONIE-AROME cy43h2.1, already tested by KNMI, MetCoOp and AEMET

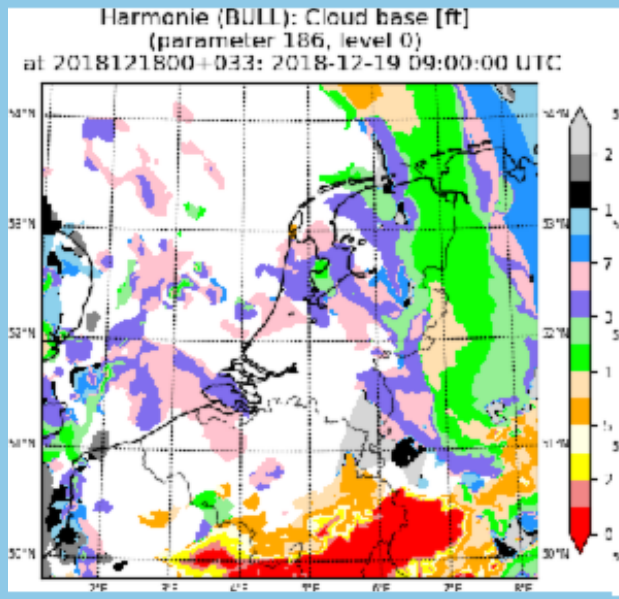


HARATU update 2

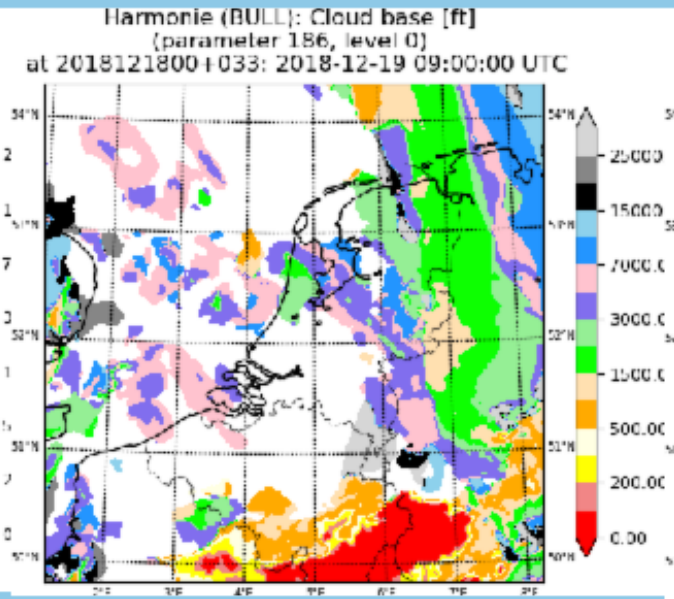
Wim de Rooy

Changes in free atmospheric length scale (LFREE), adjusted statistical cloud scheme and adjustment in calculation of combined length scale
-> more low clouds. In time for HARMONIE-AROME cy43h2.1?

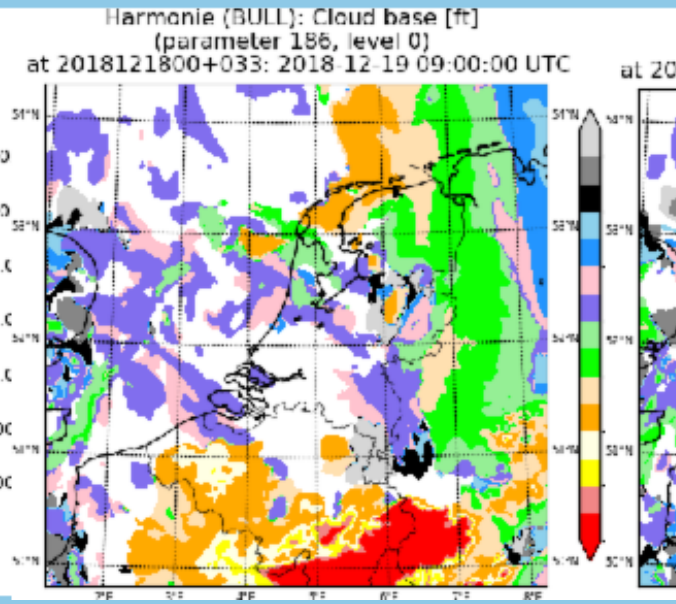
REF



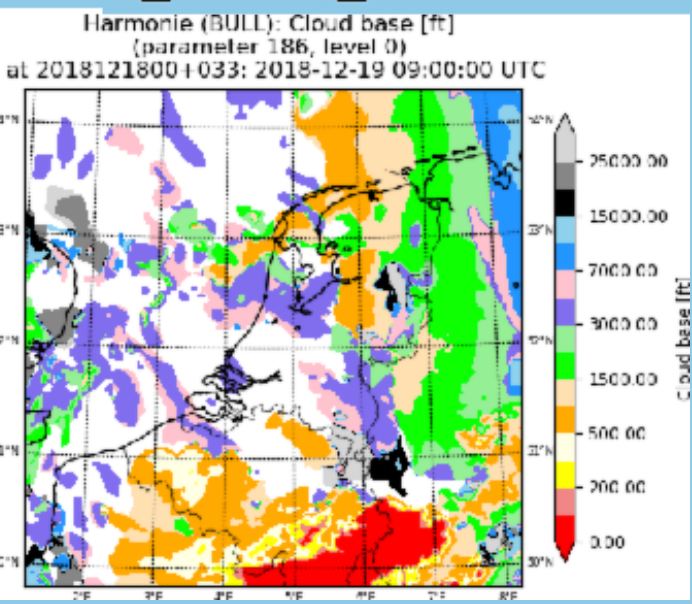
NEWSTAT



POW2_LFREE_ZCH



NEWSTAT and POW2_LFREE_ZCH



40h1.2tg2, NOHARATU
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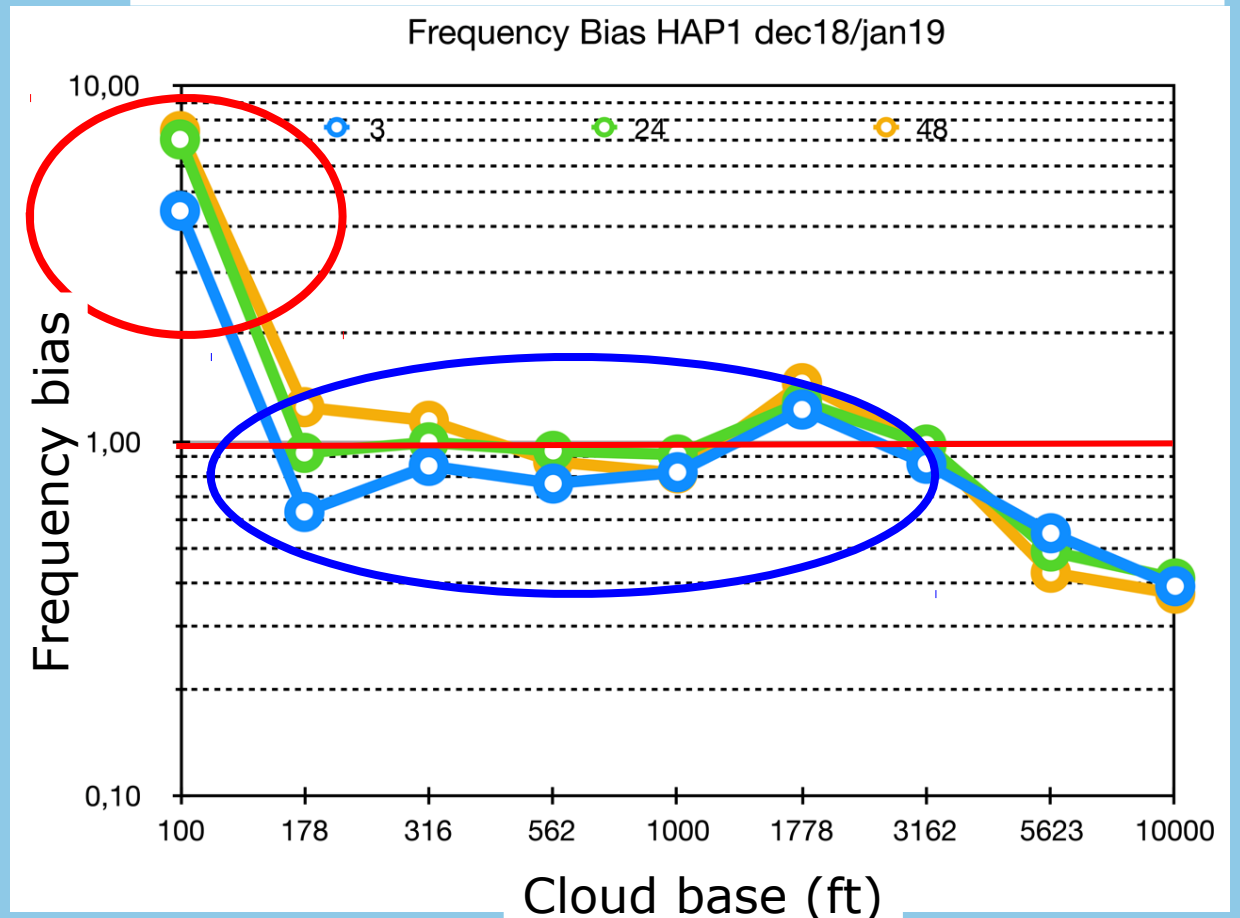

40h1.1.1
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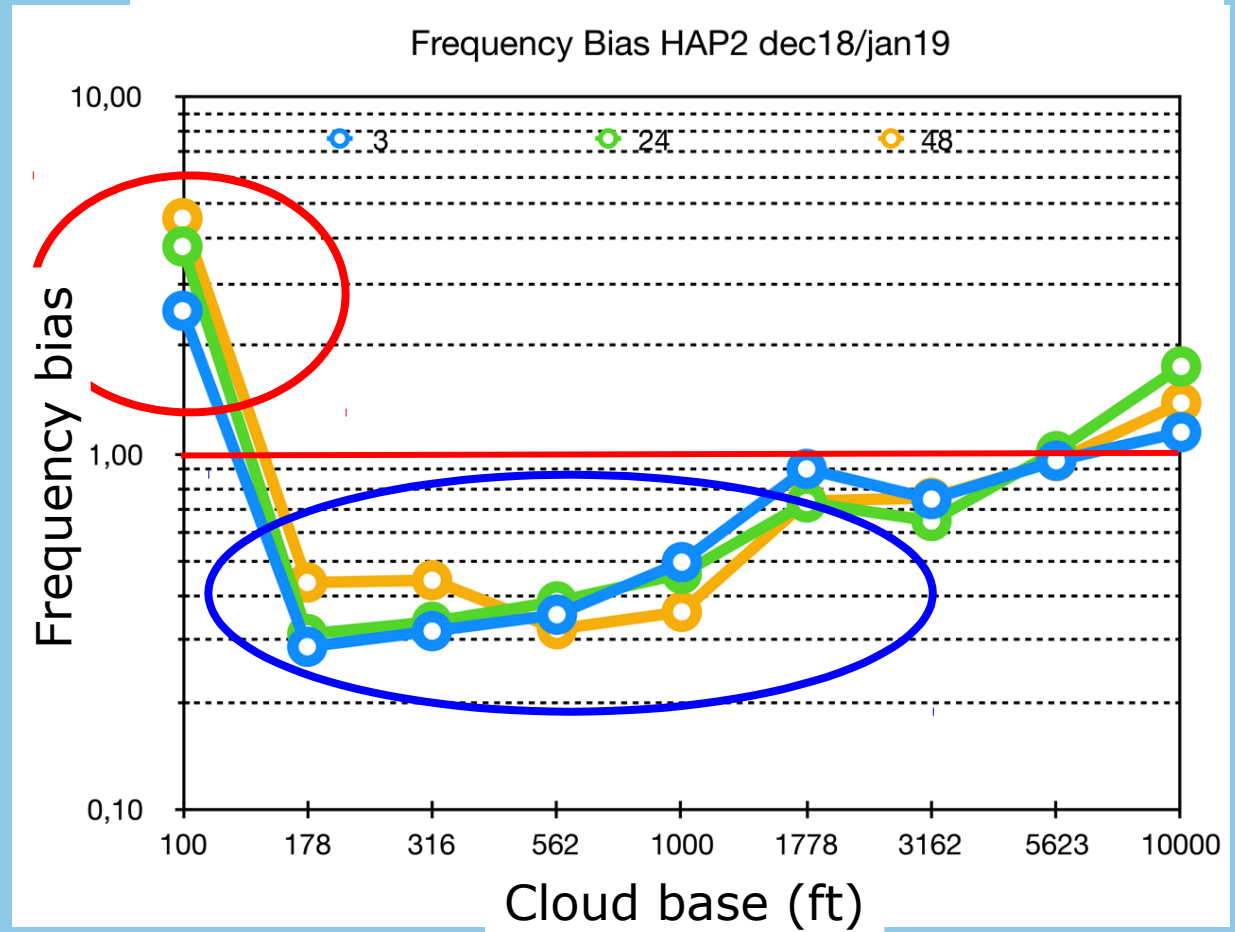


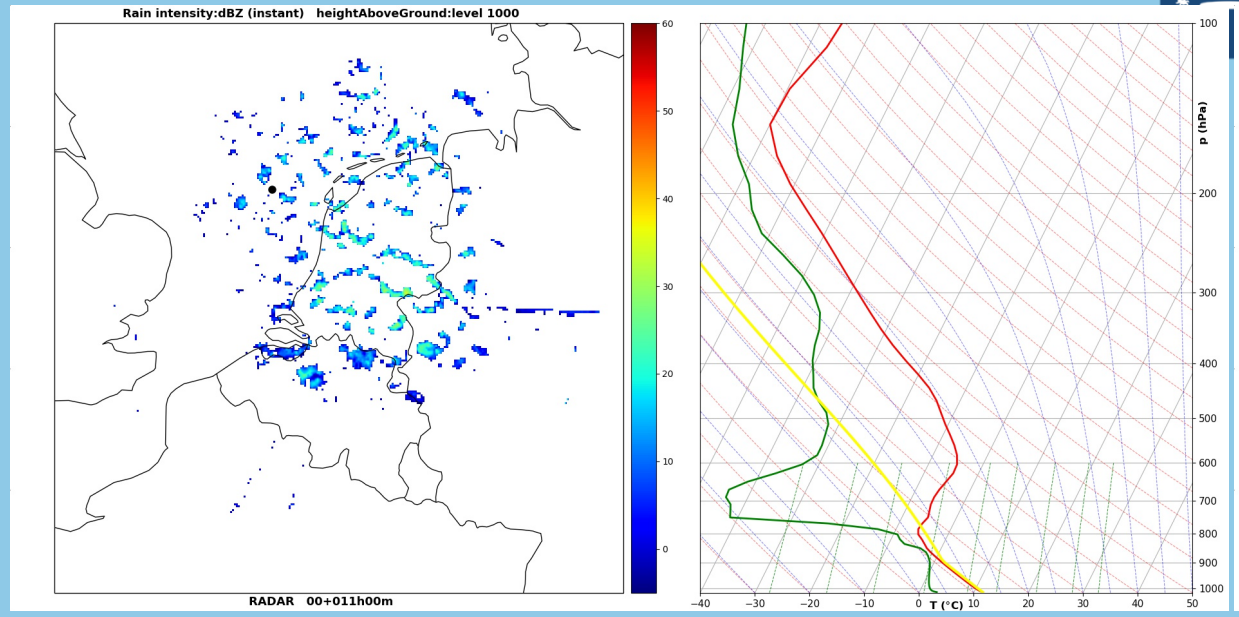
Convection problems

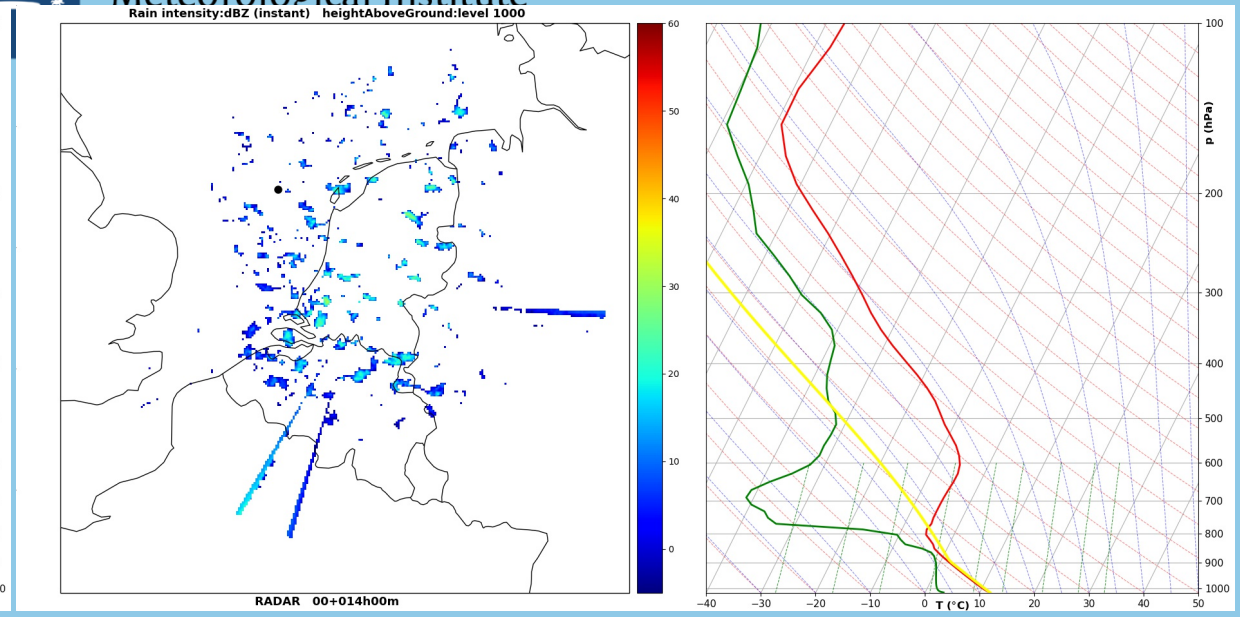
- No initiation of some deep convection
  - Related to surface problems, drying out of soil -> possible fix
  - Other cases unexplained
- Missing showers in specific conditions: clouds warmer than -15°C, open cell convection over the sea
- Missing stratiform stage after severe deep convection, precipitation too small scale and dying out too quickly

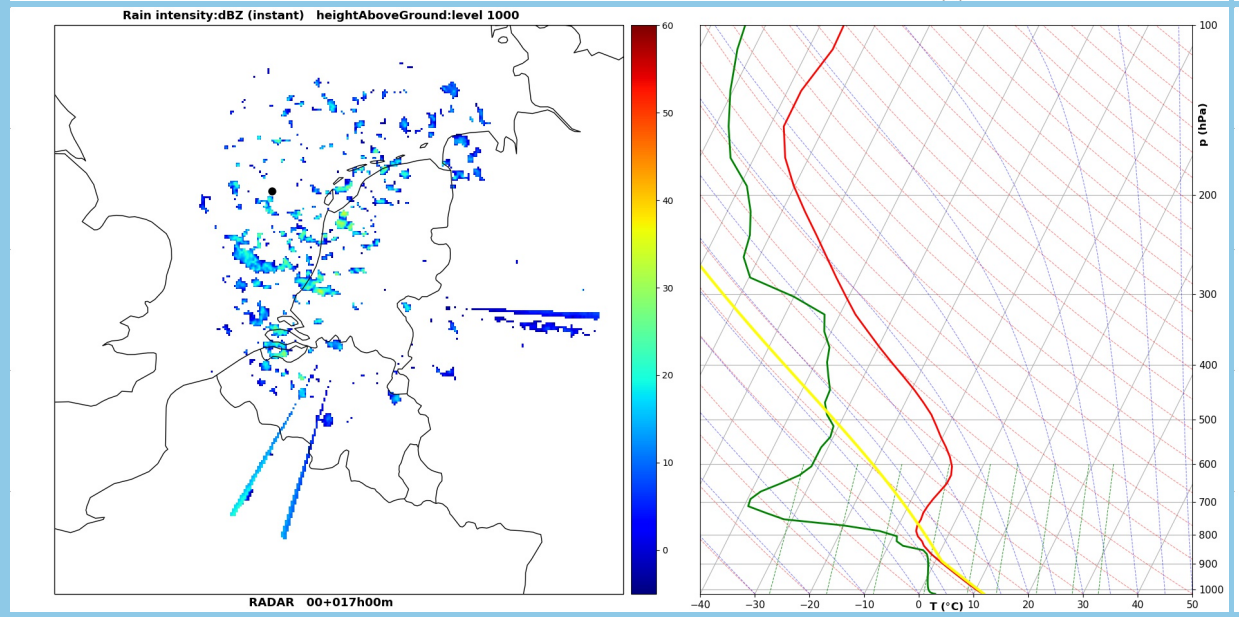
2017-10-29: open cell case; RADAR

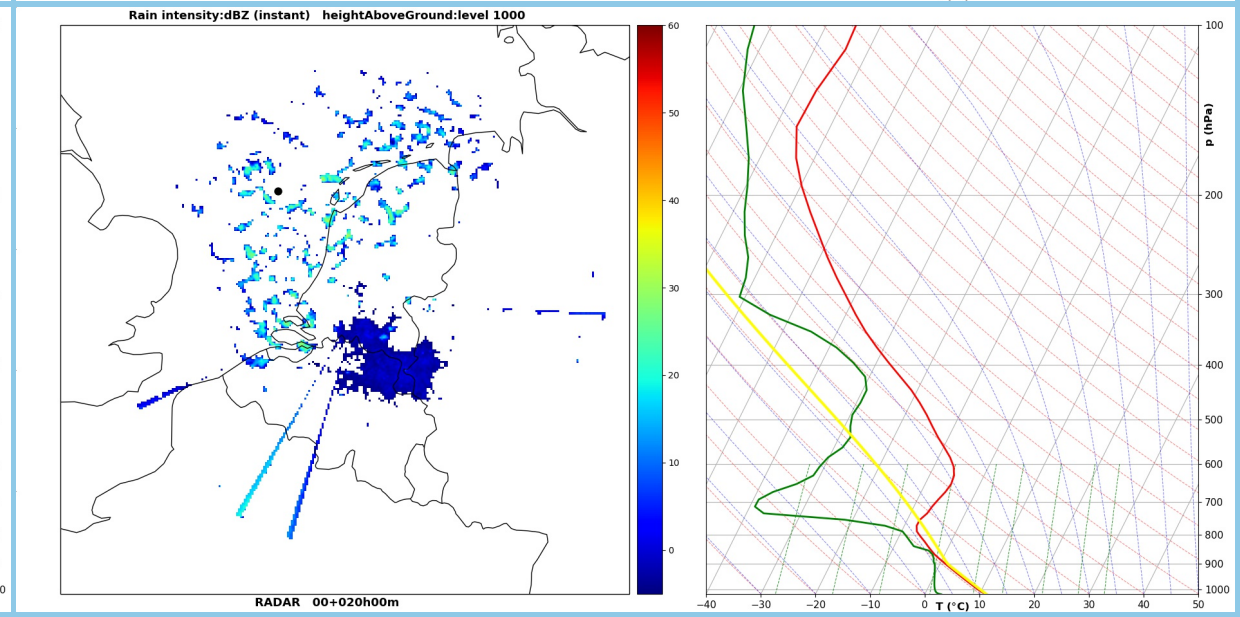
Bram van 't Veen

Meteorological Institute









2017-10-29: open cell case; REF

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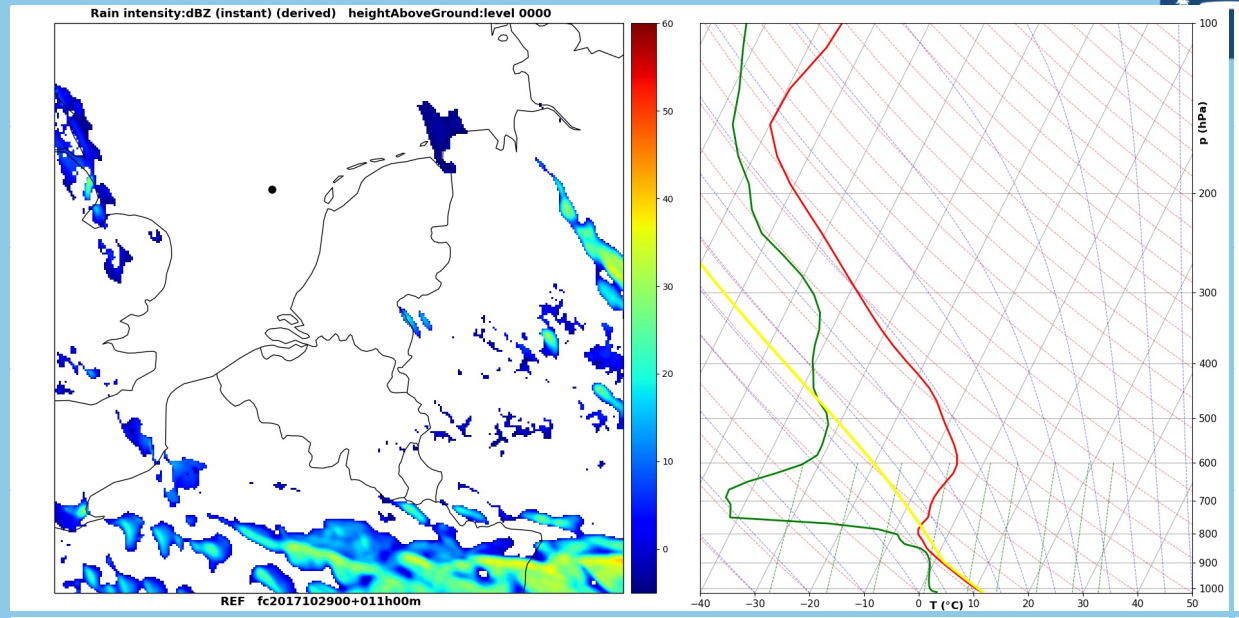

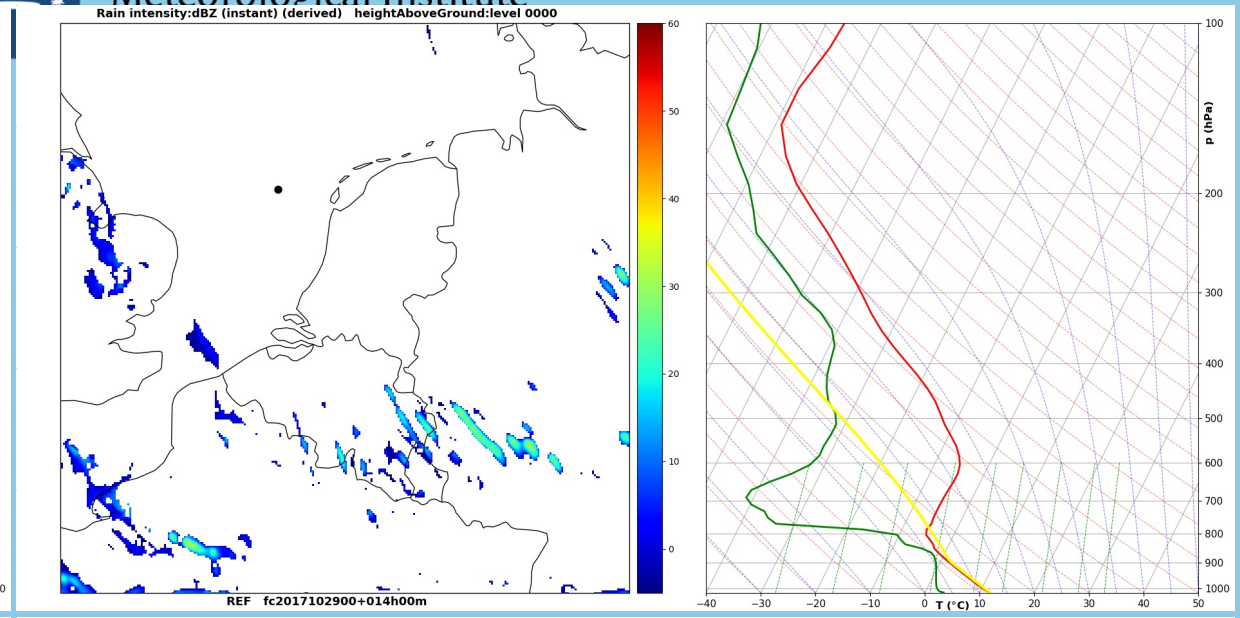

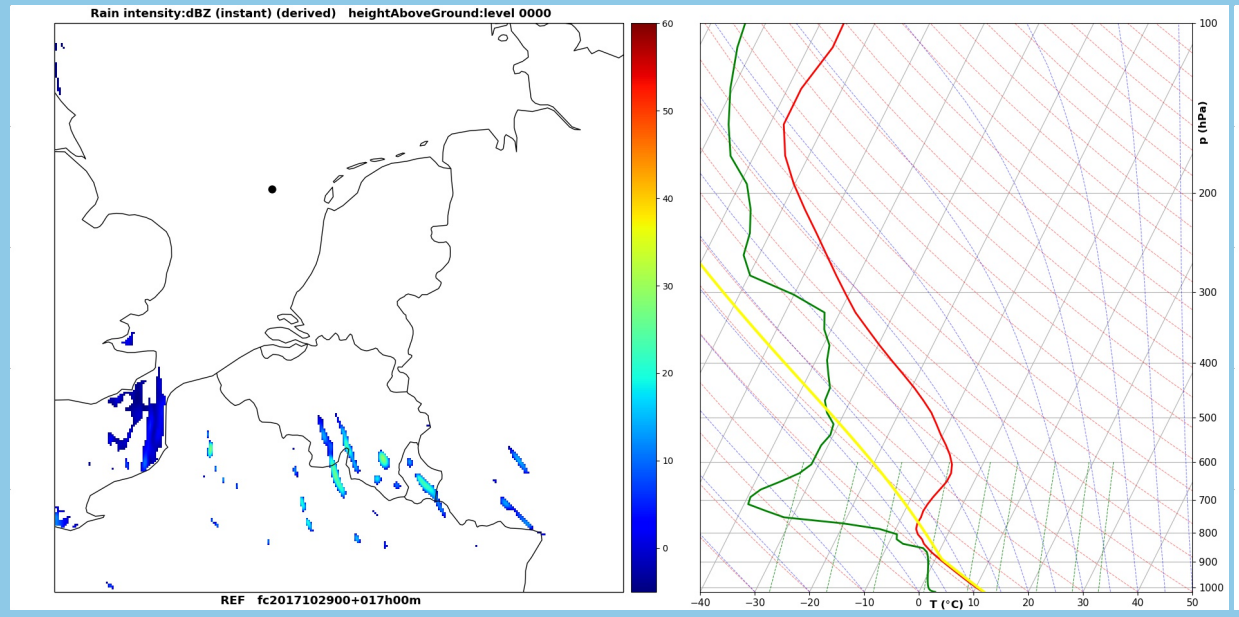

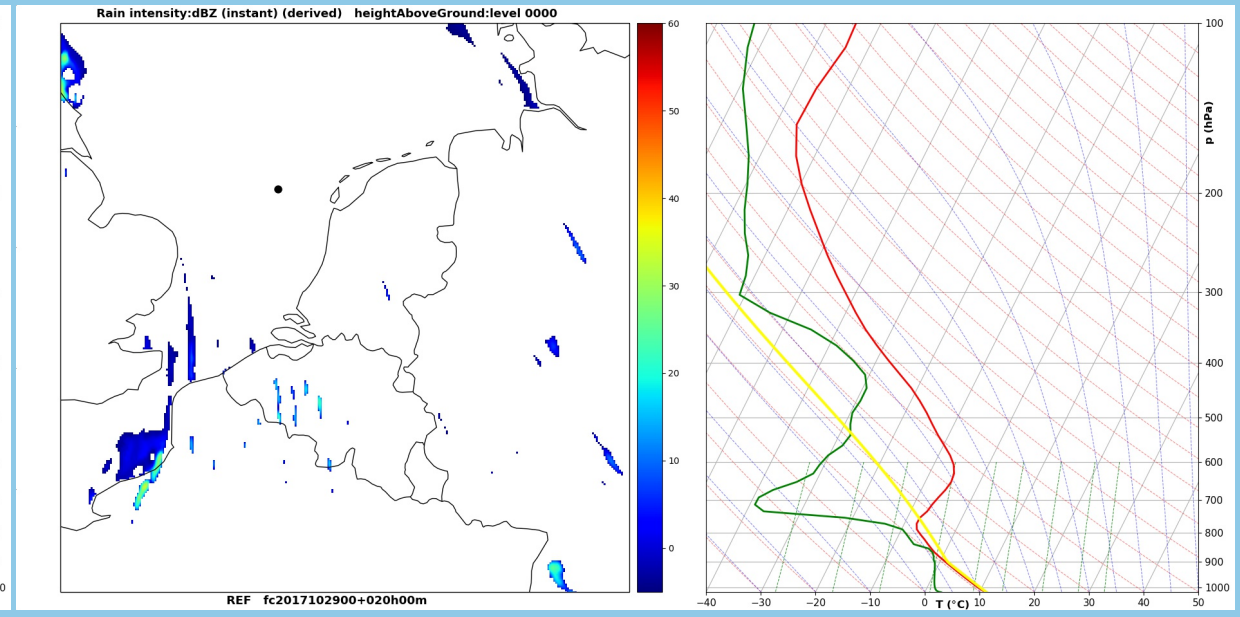

2017-10-29: open cell case; NOSHALL

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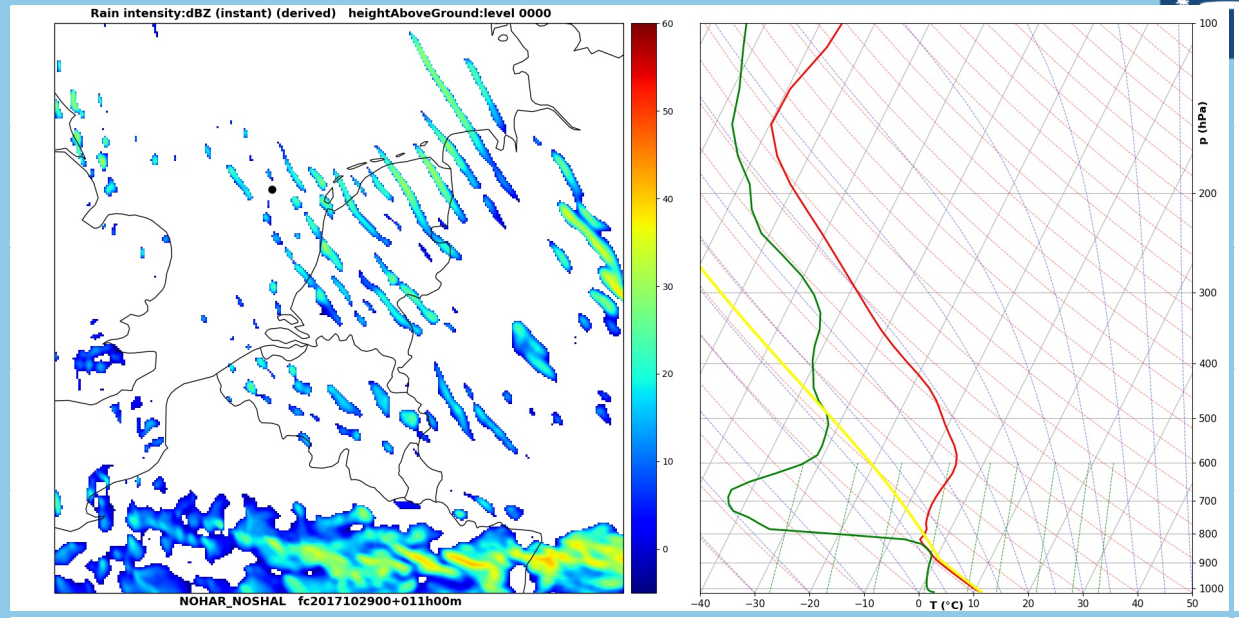

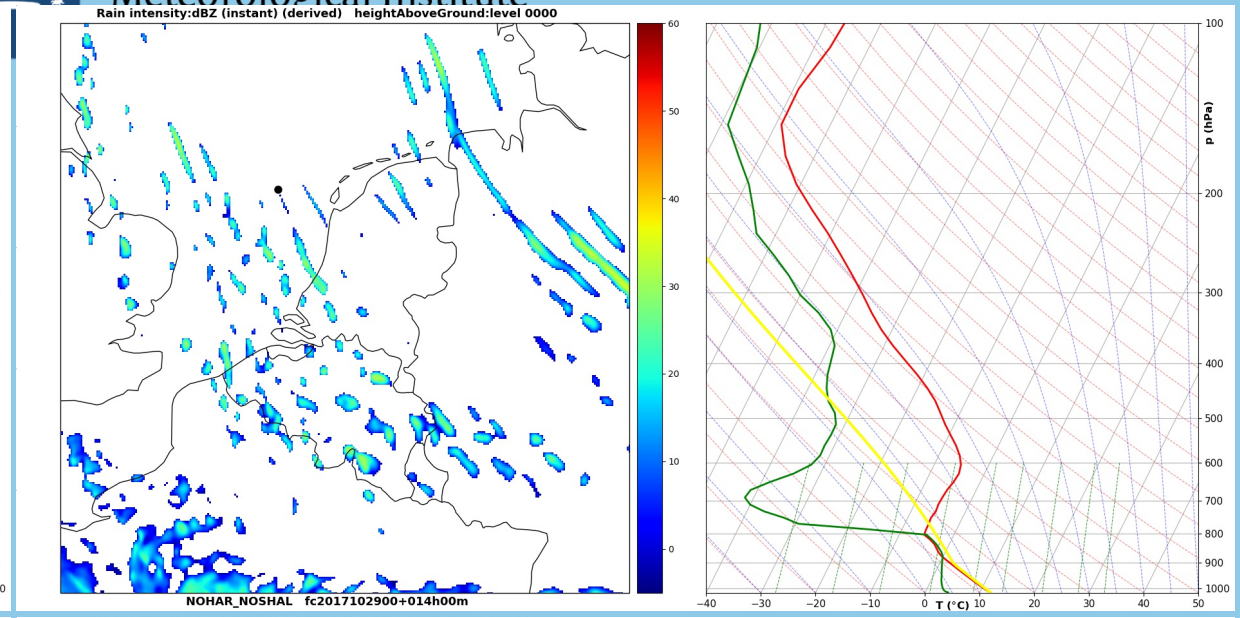

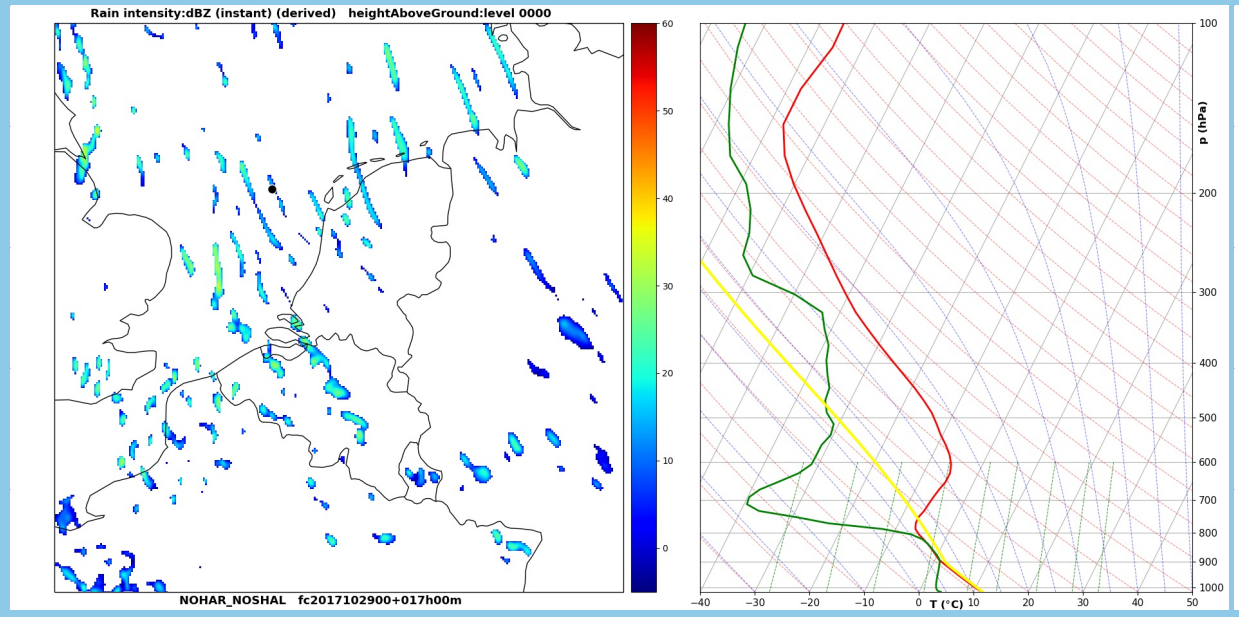

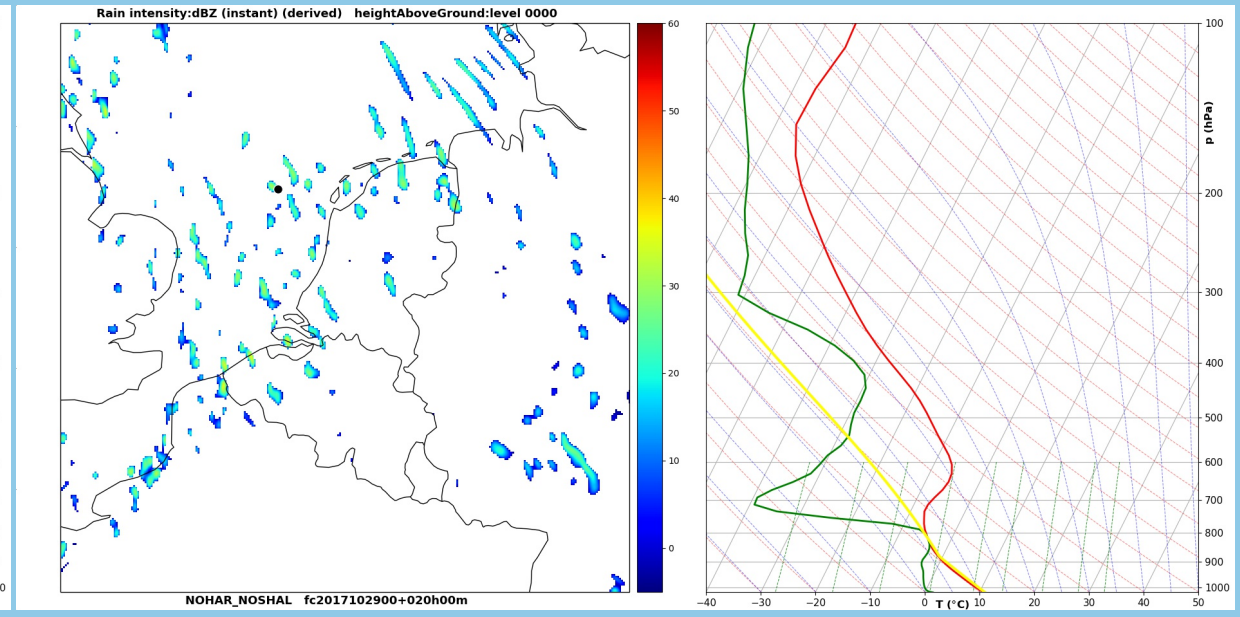

2017-10-29: open cell case; RADAR

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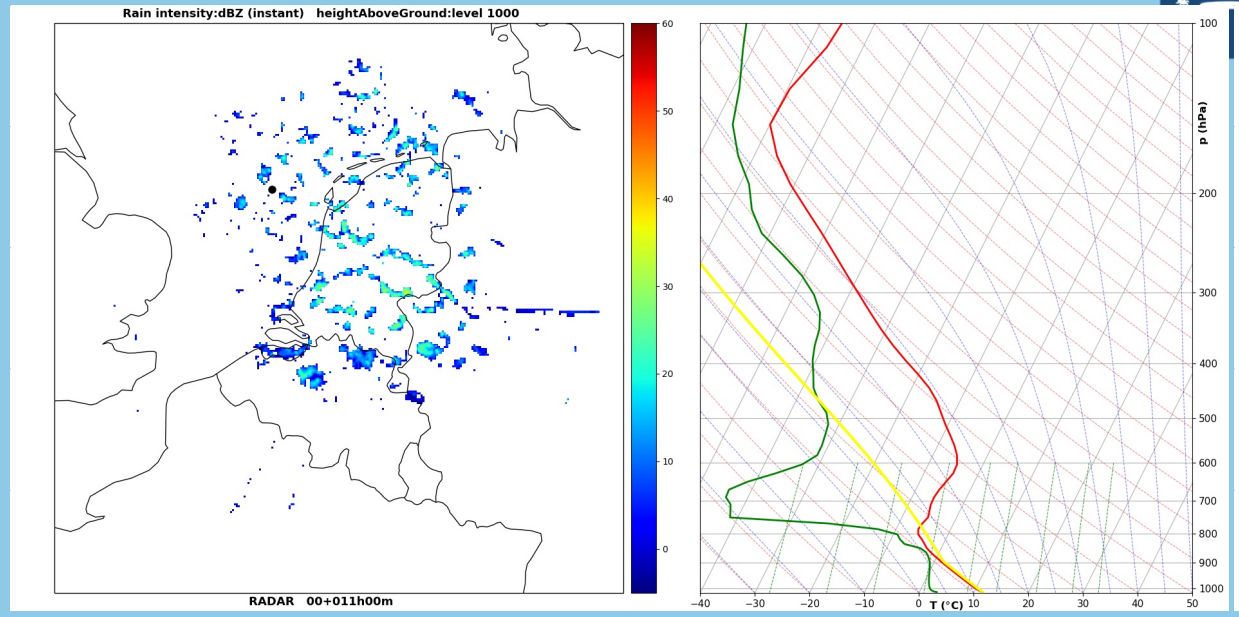

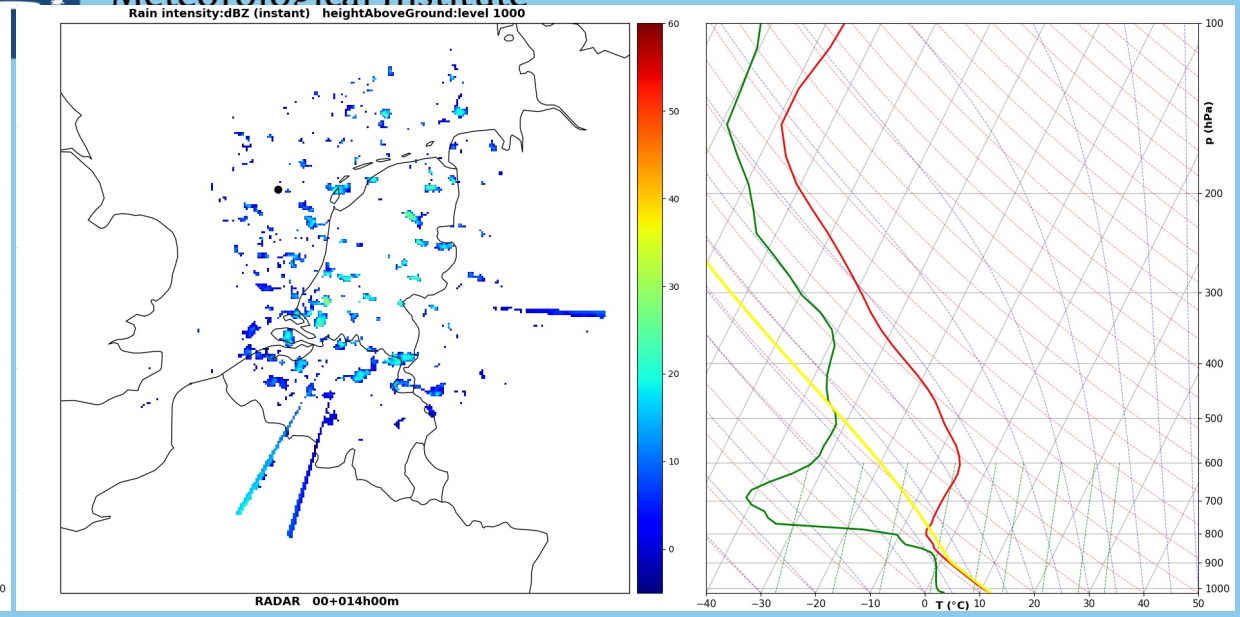

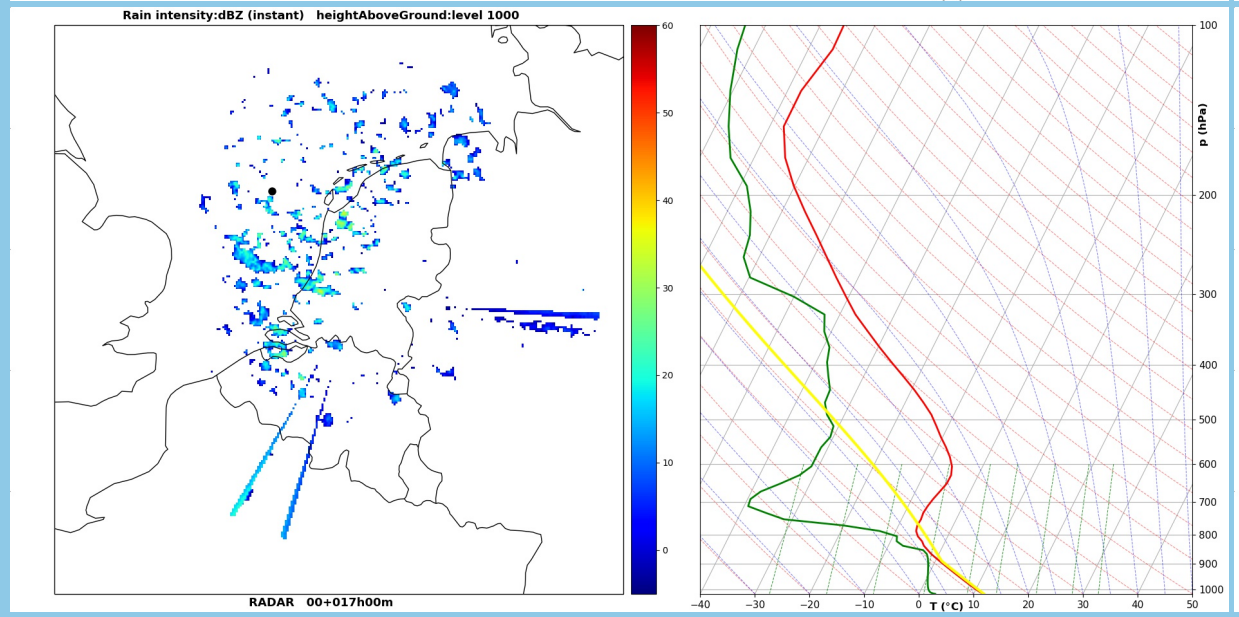

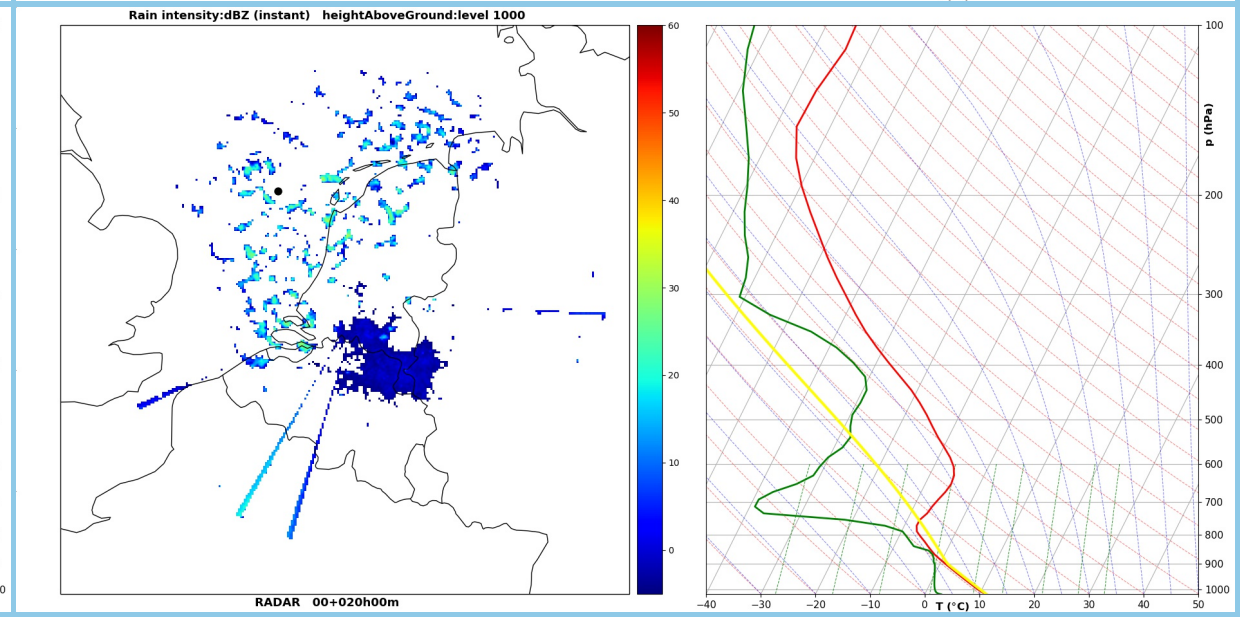

2011-09-10, supercell case; RADAR

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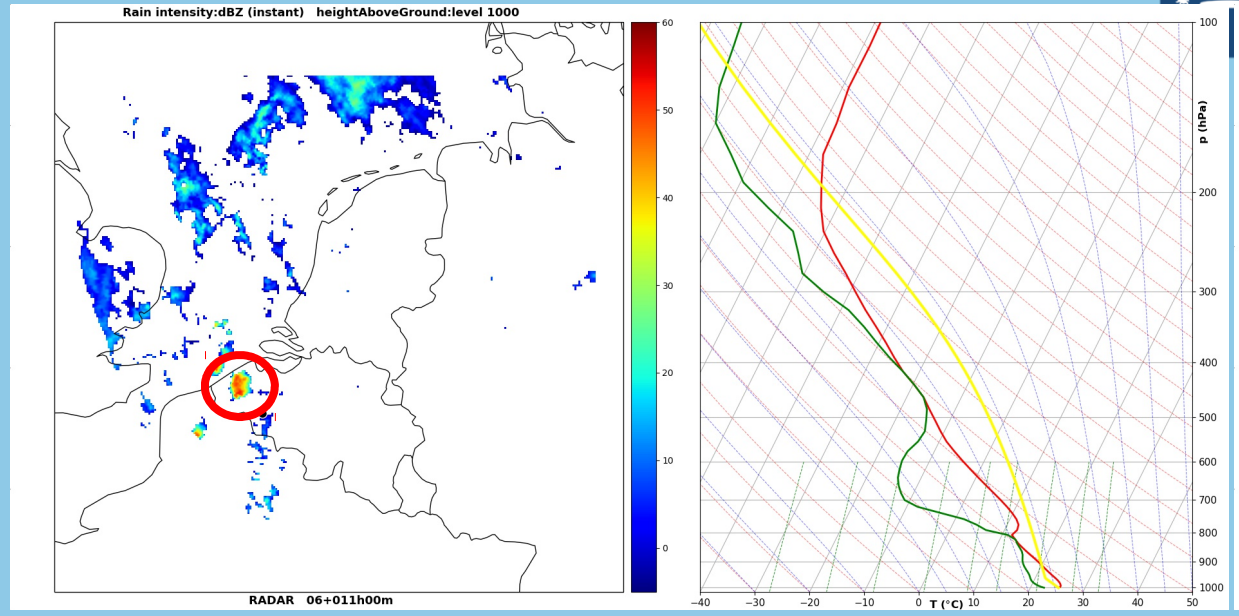

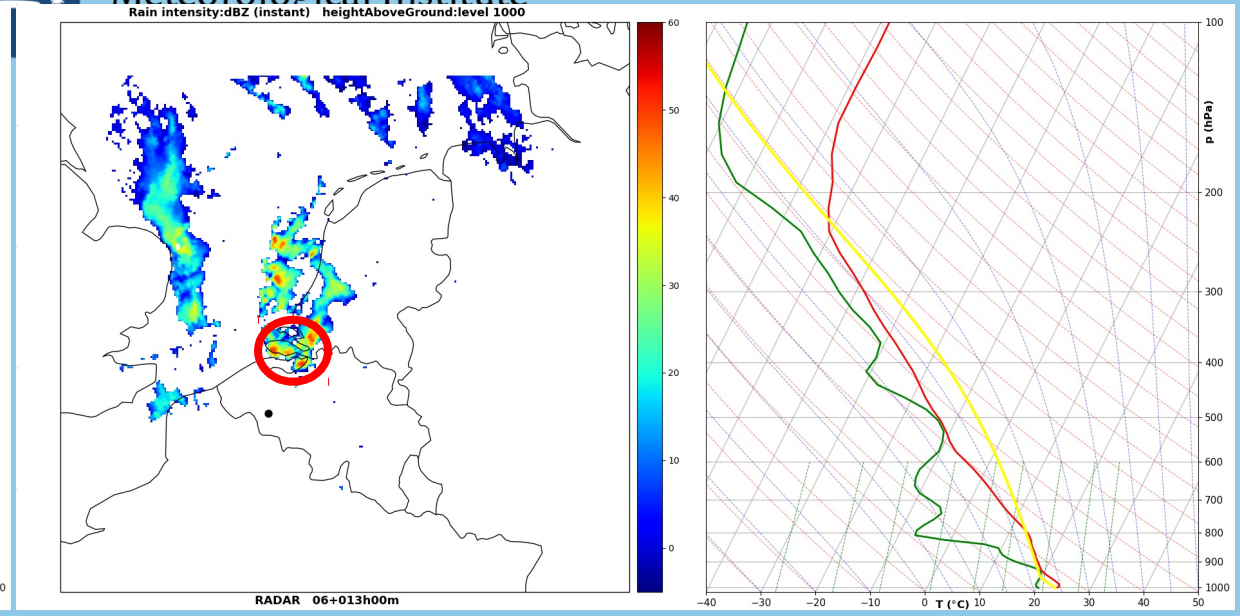

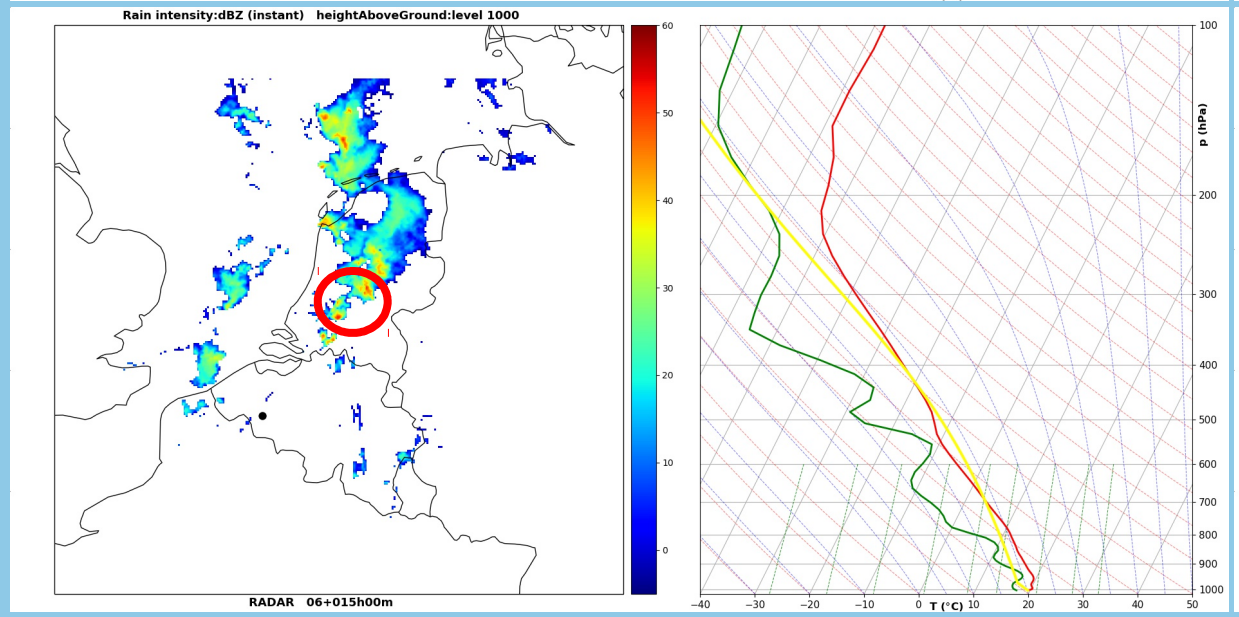

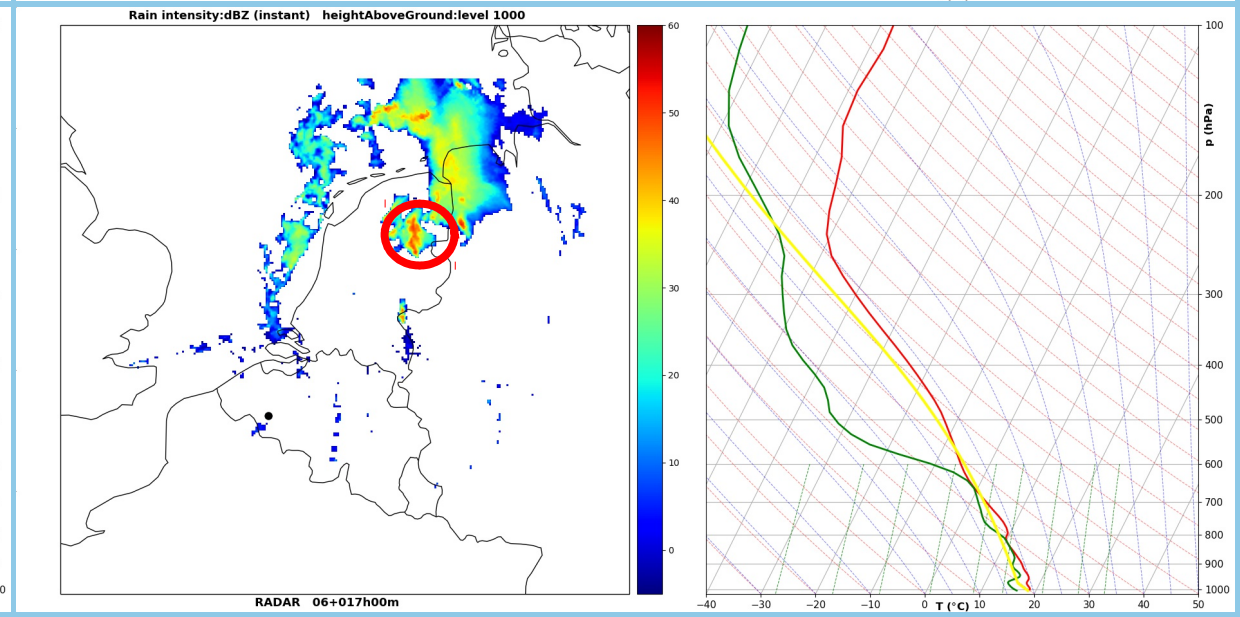

2011-09-10, supercell case; 40h1.1.1

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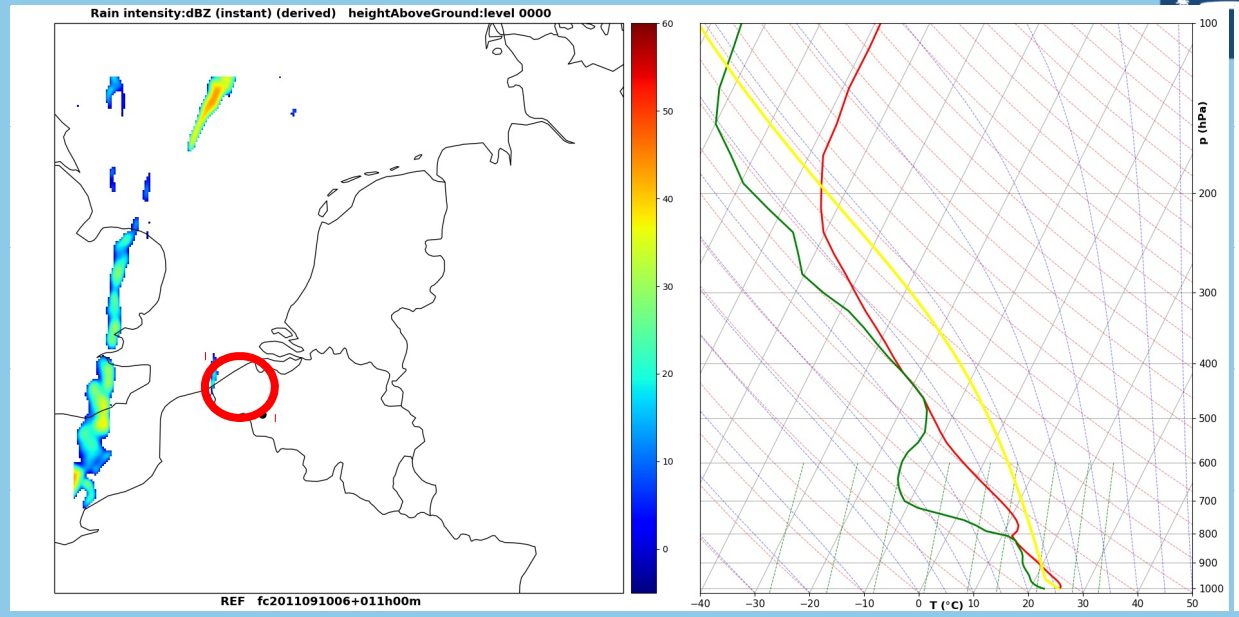

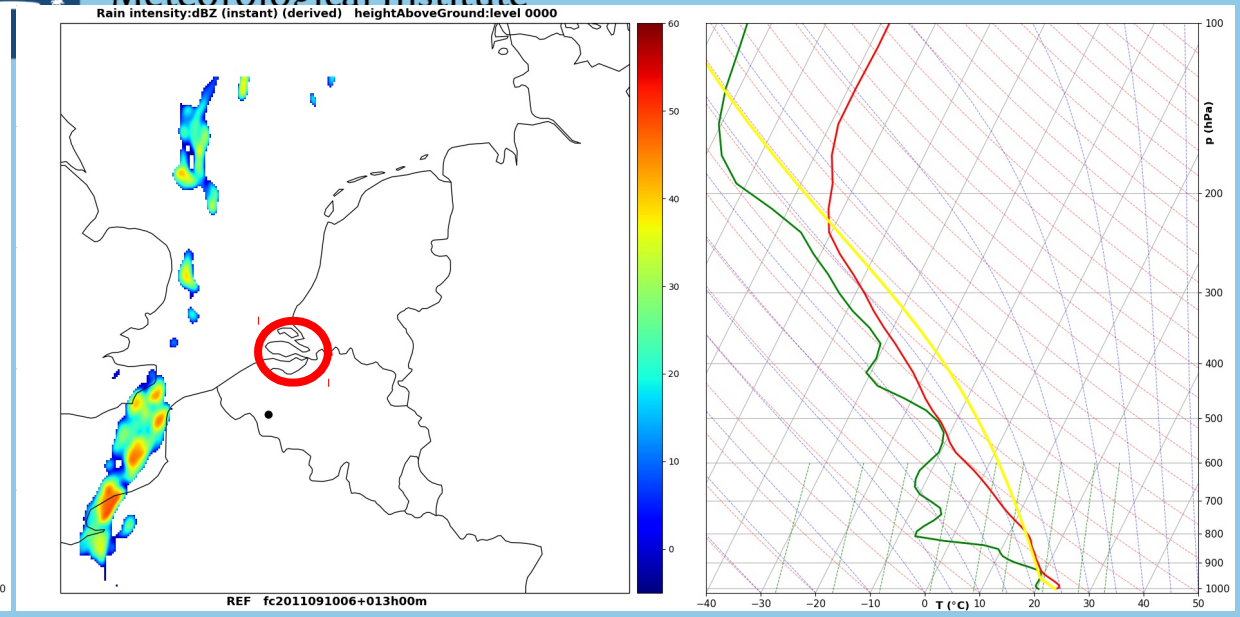

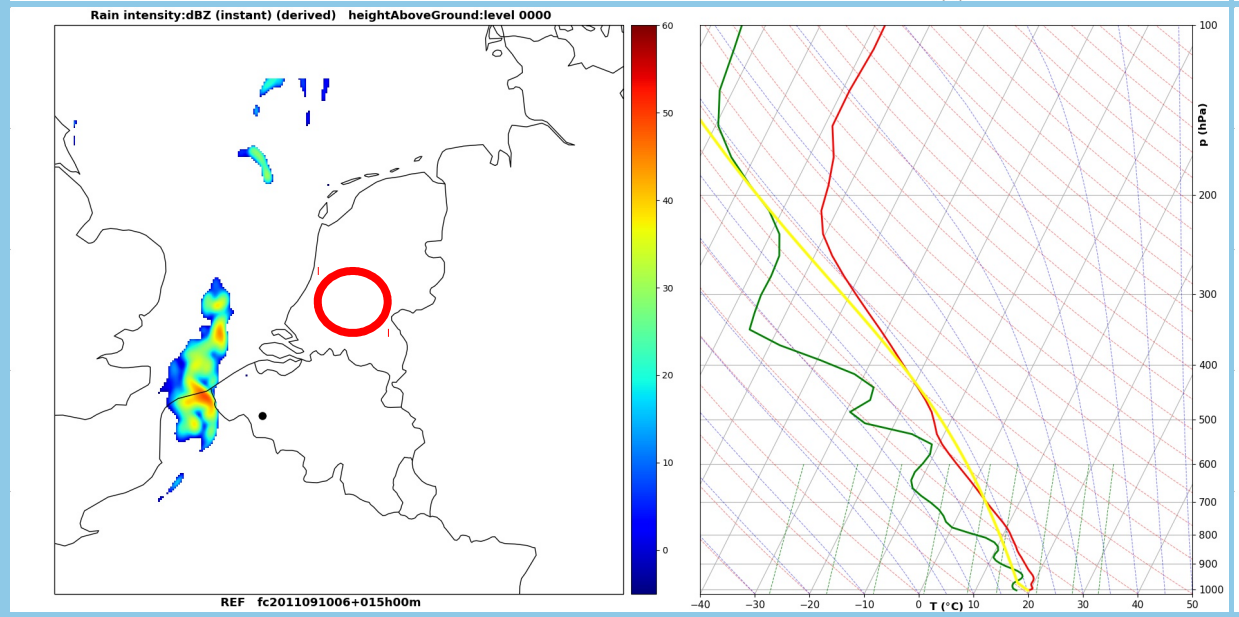

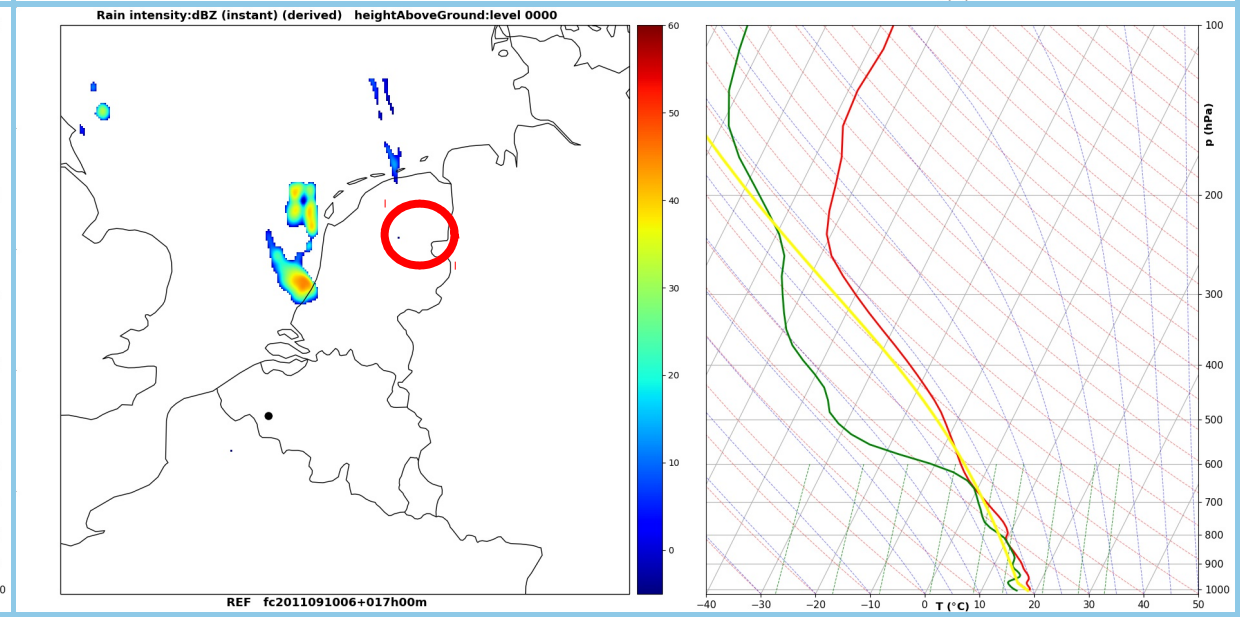

2011-09-10, supercell case; NOHARAT

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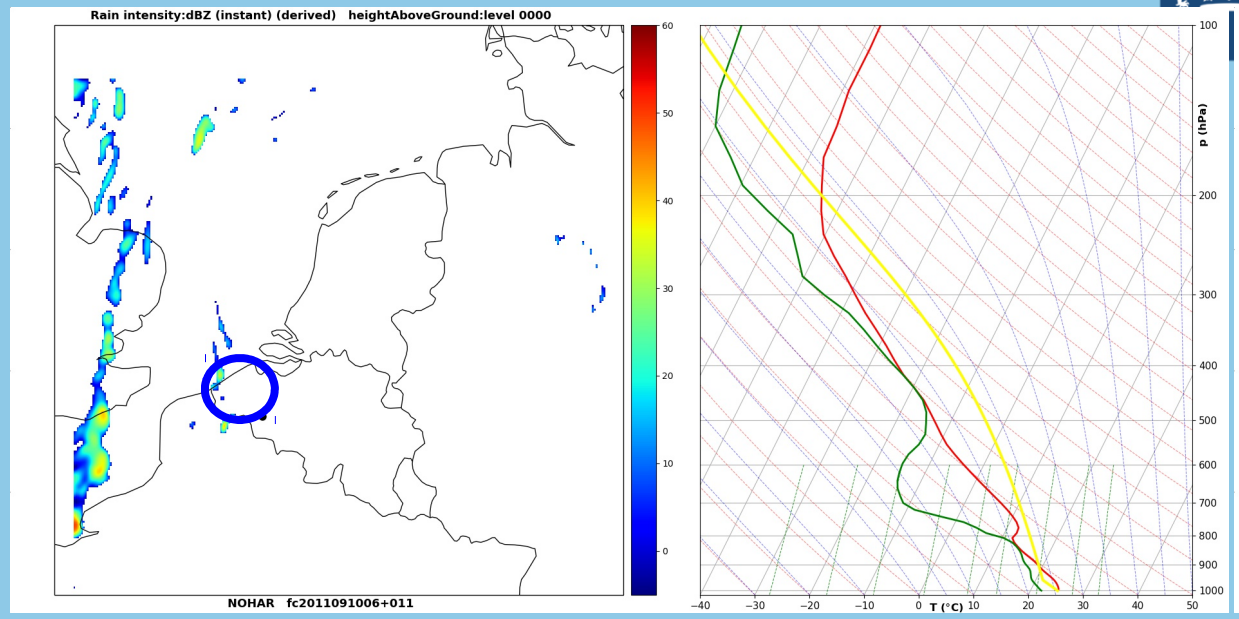

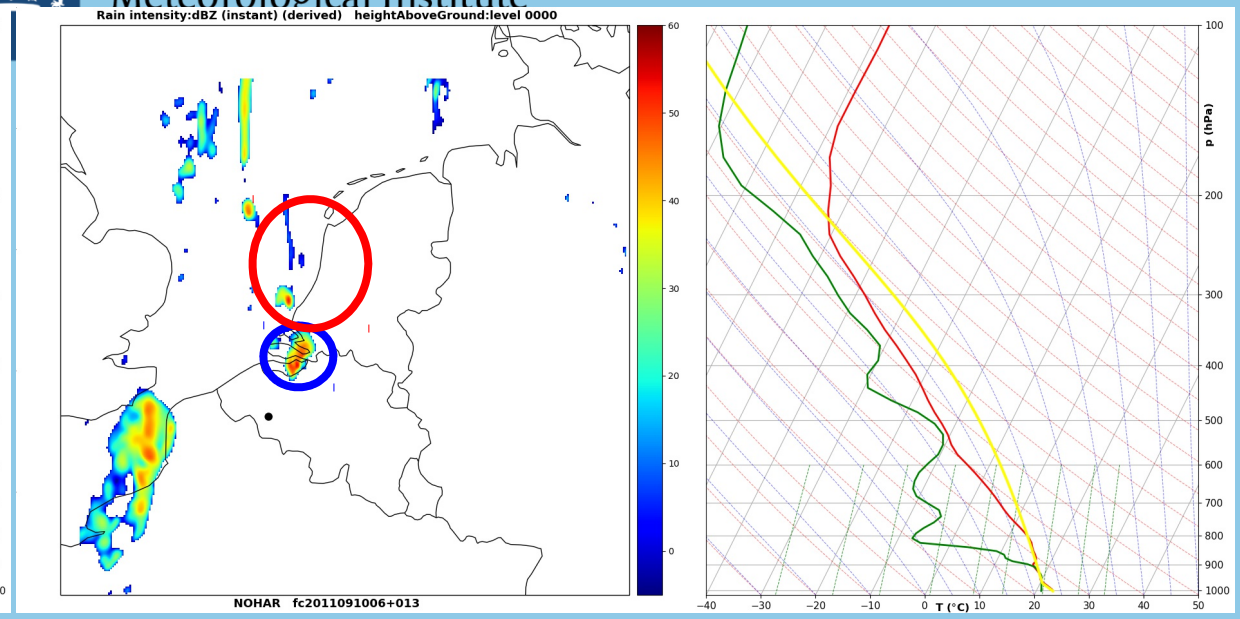

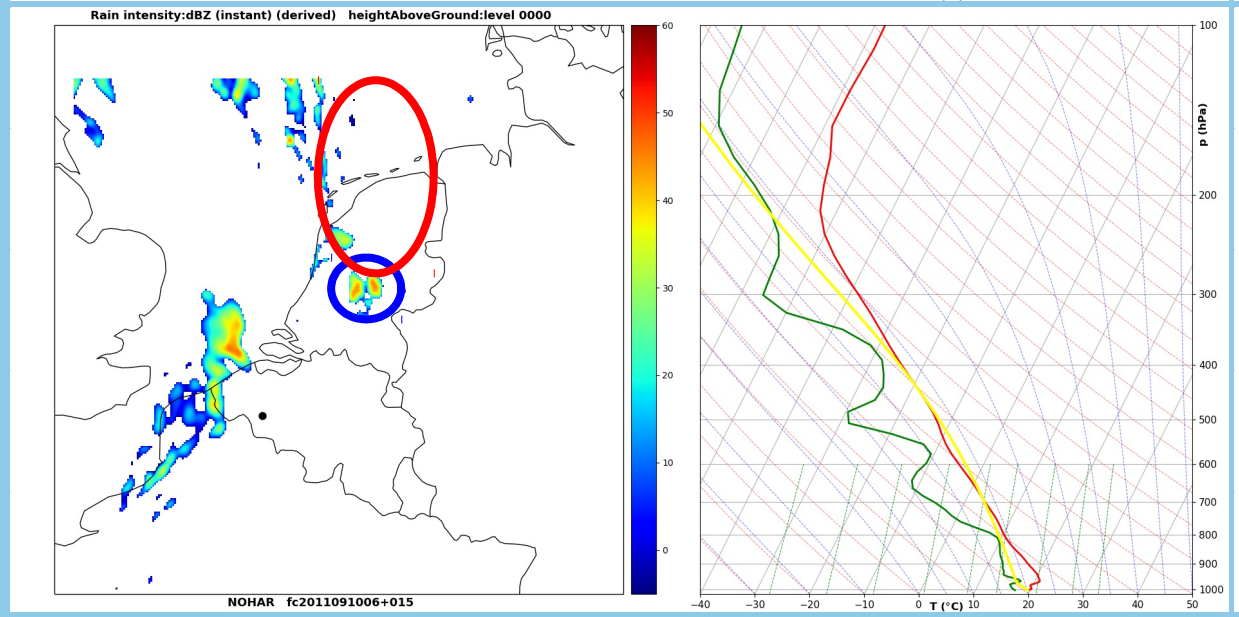

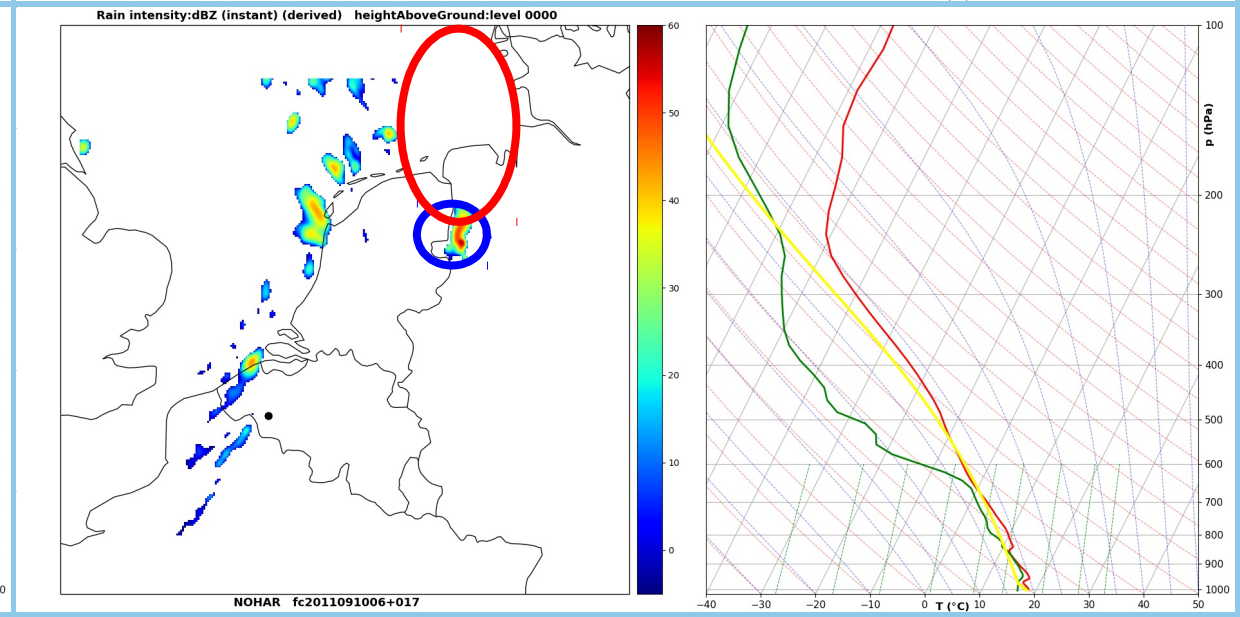

2011-09-10, supercell case; RADAR

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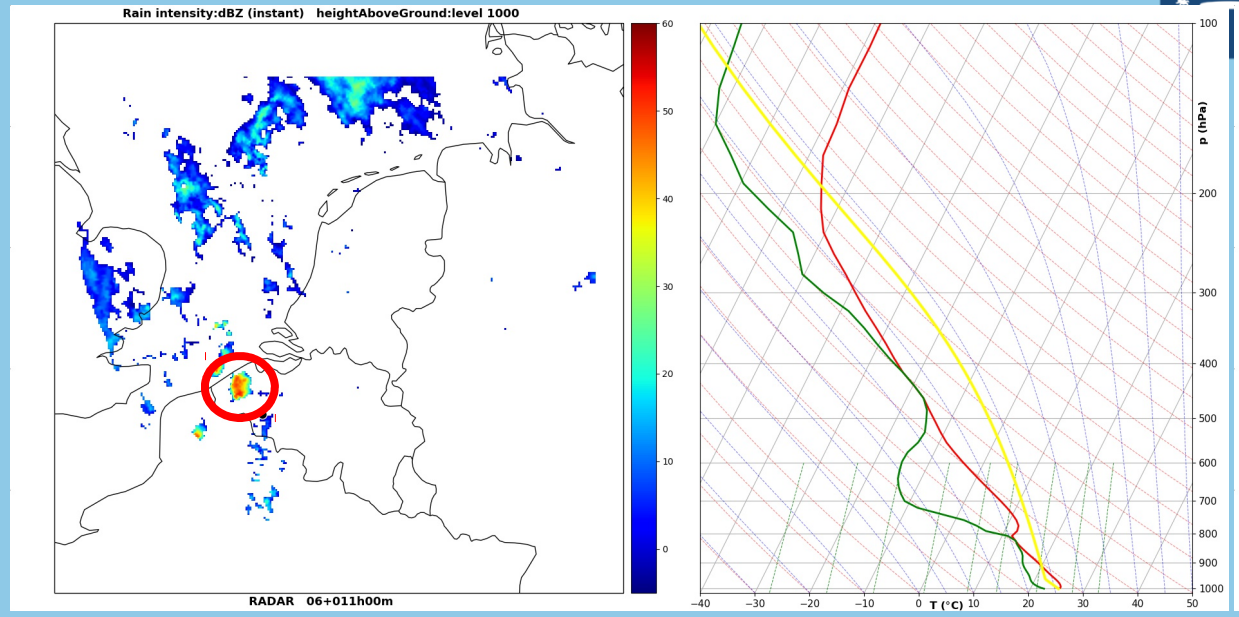
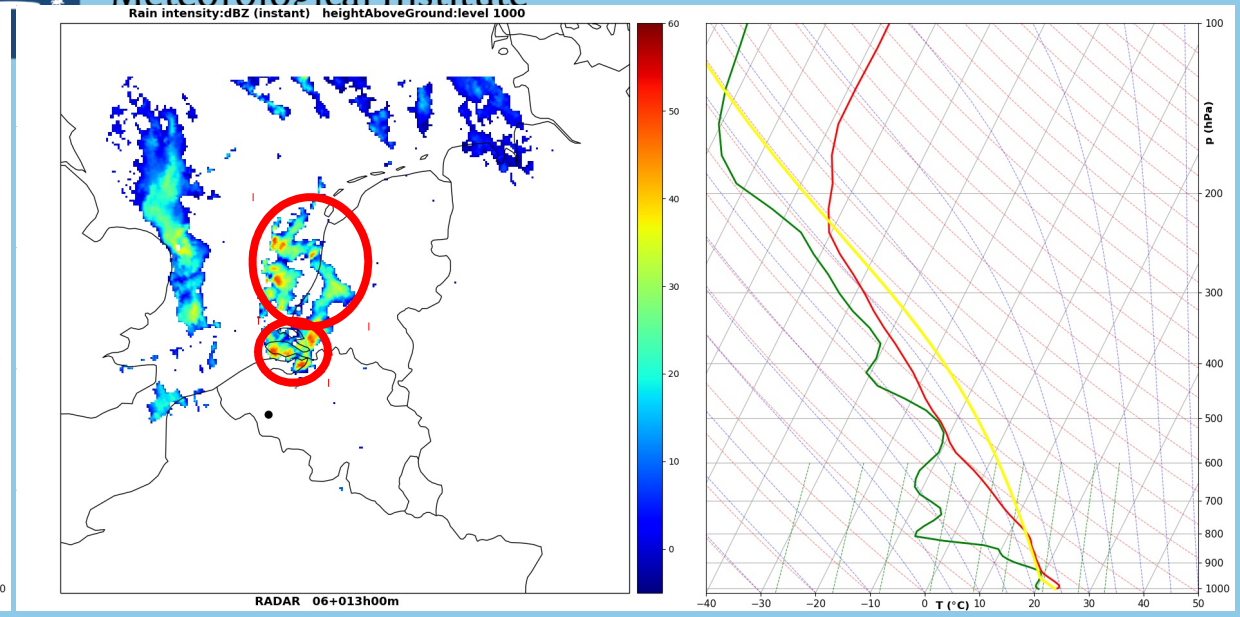
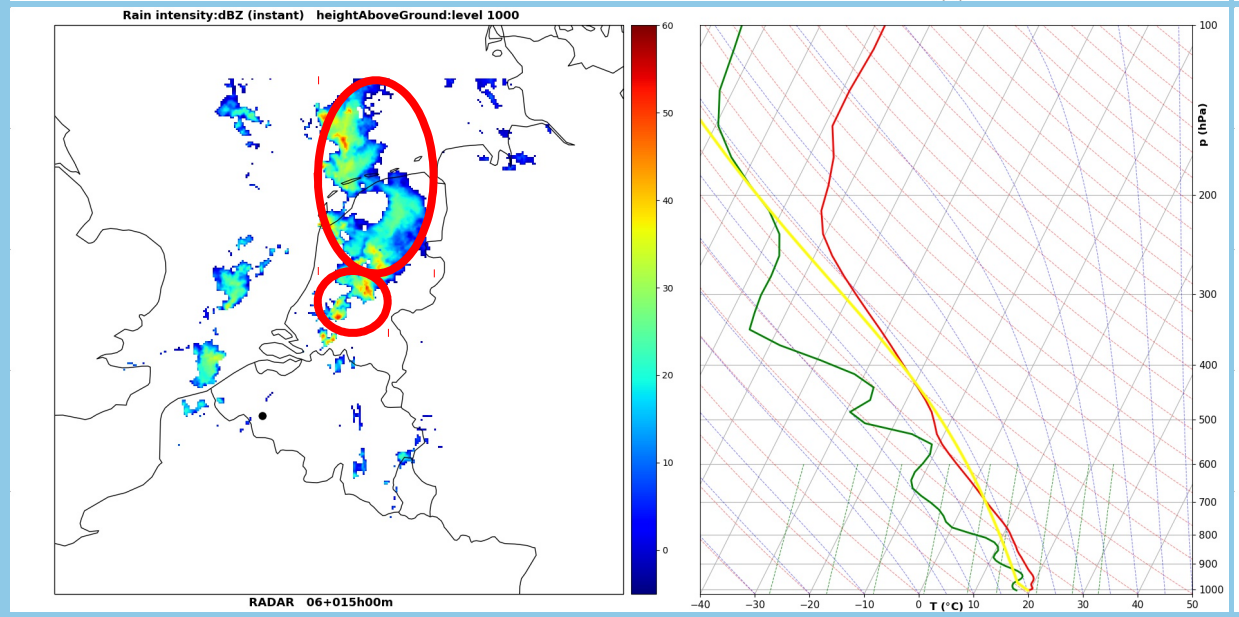
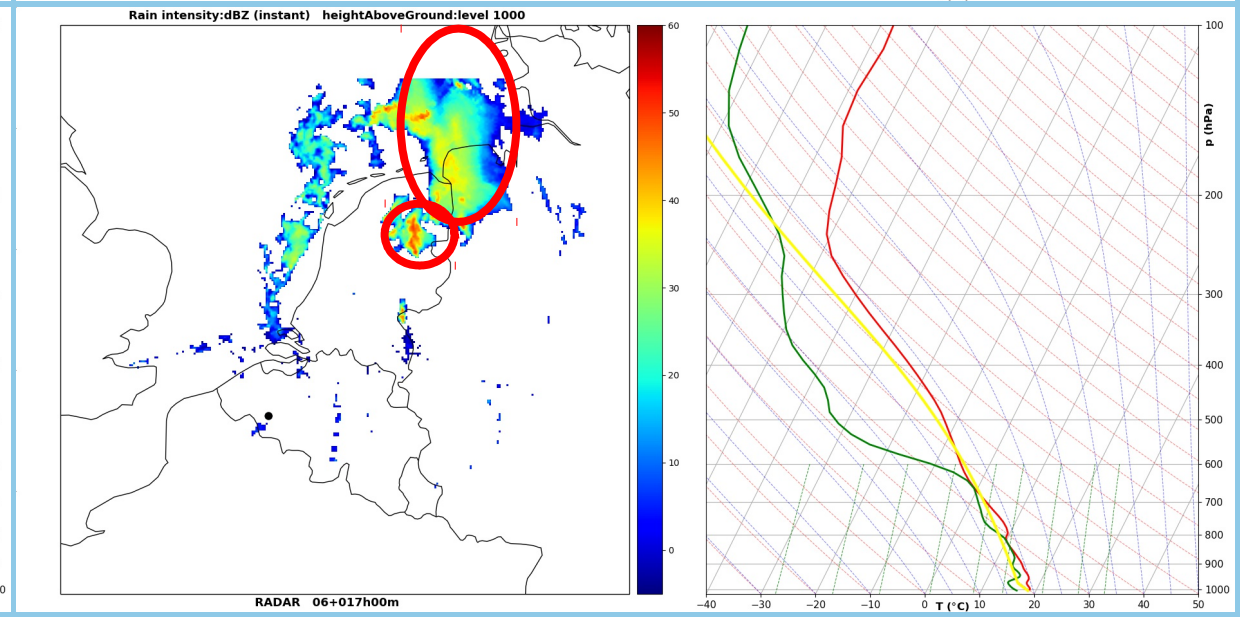


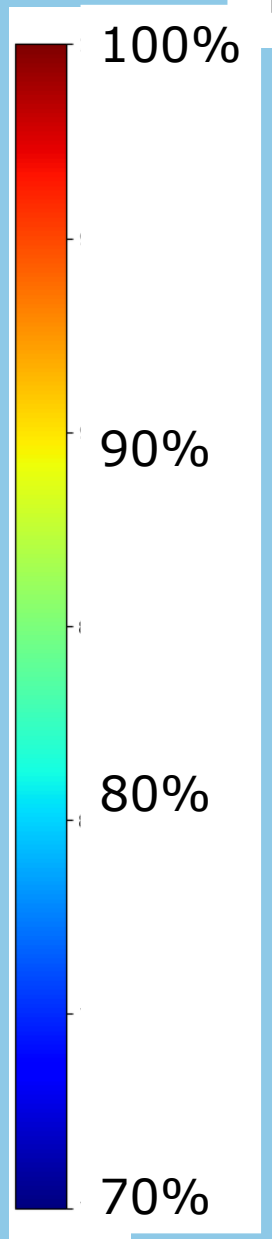


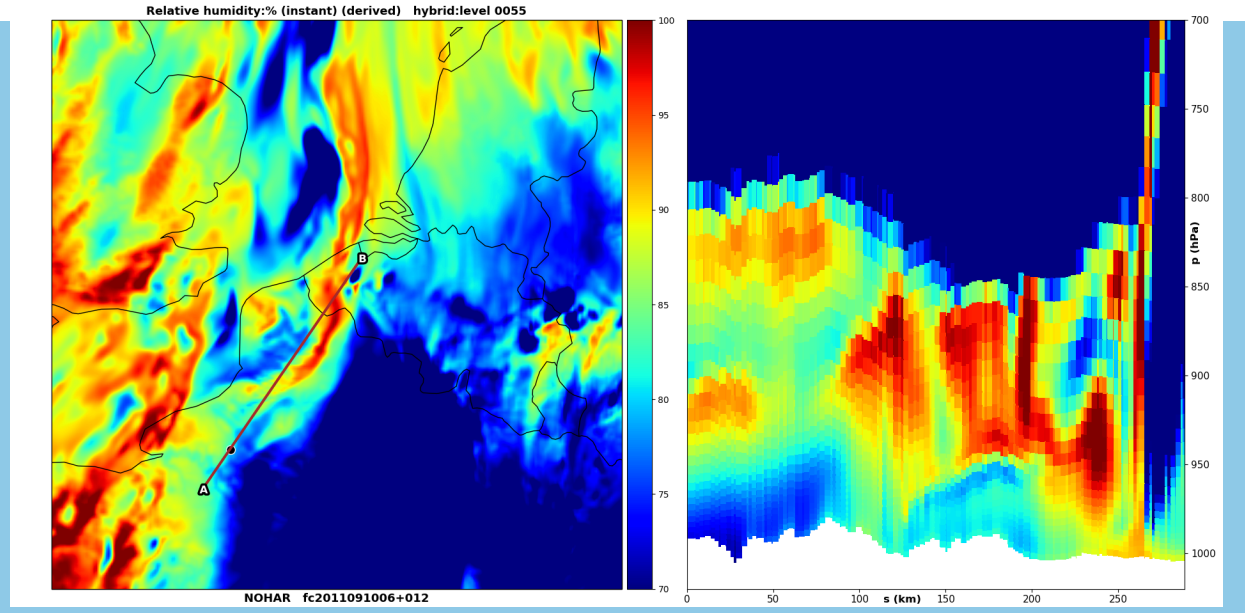




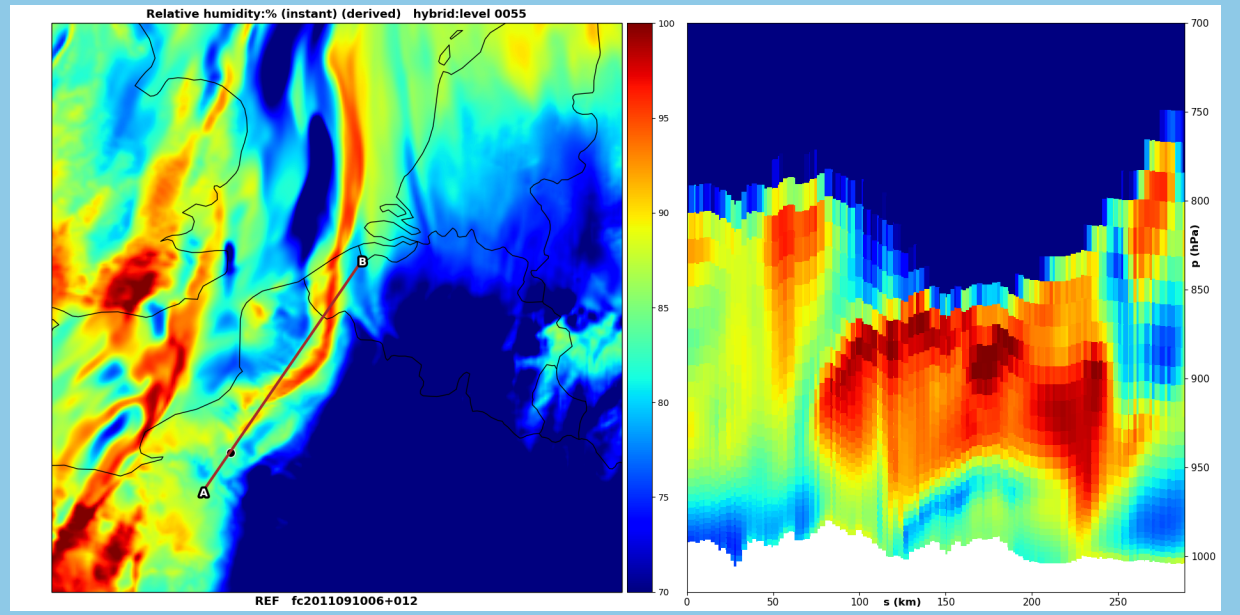
Relative humidity
Model level 55 / cross section

Bram van 't Veen





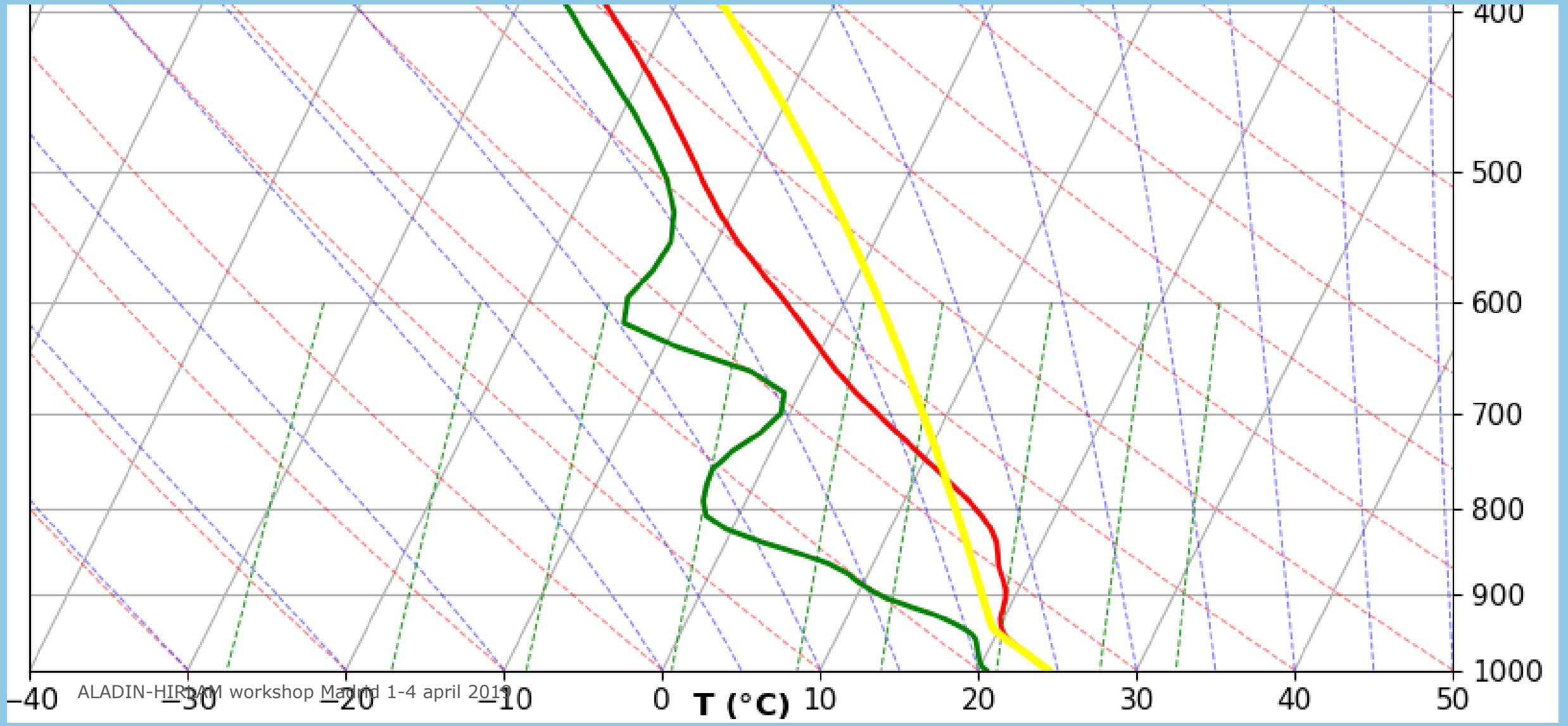
NOHARATU



Reference

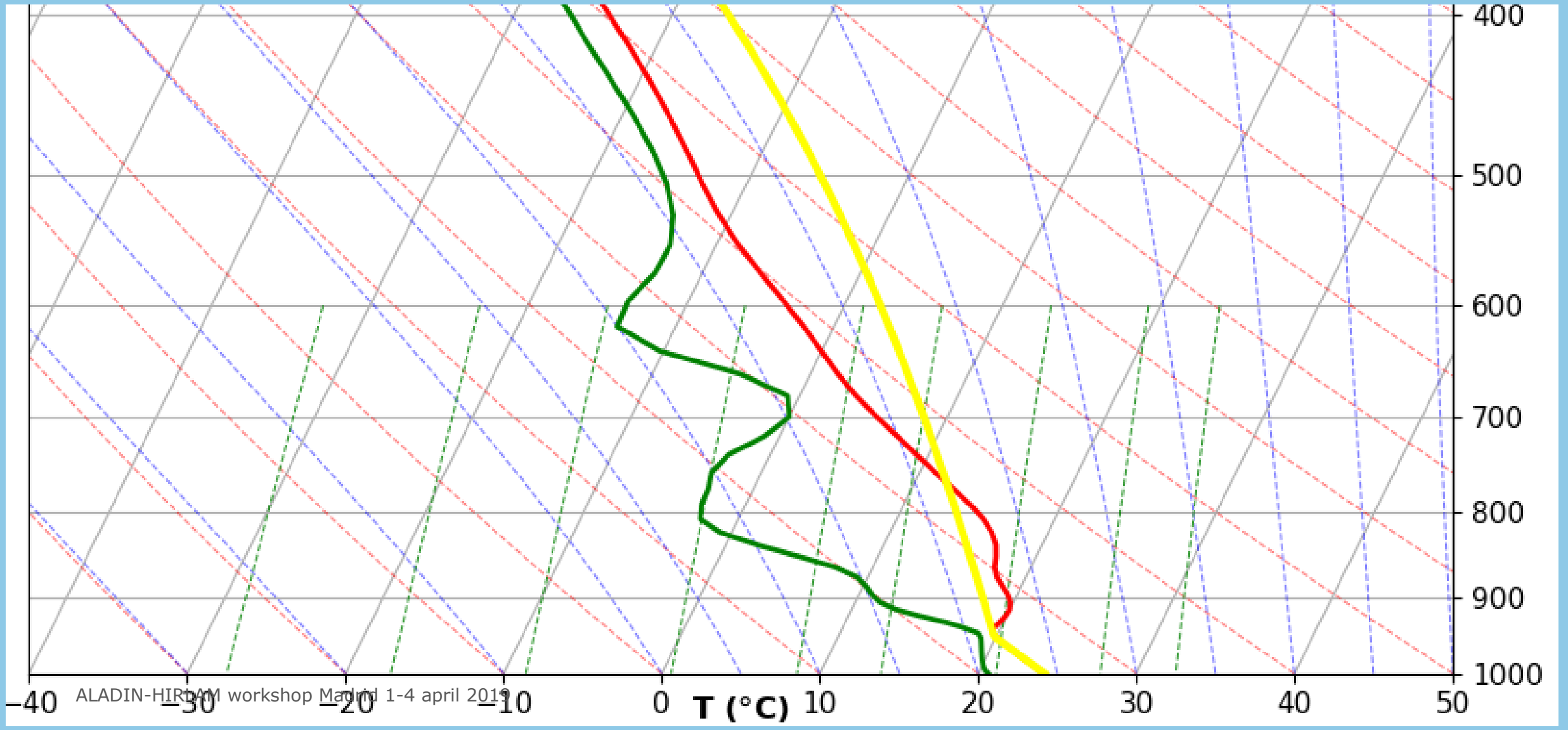
Skew-T: Reference

Bram van 't Veen



Skew-T: NOHARATU

Bram van 't Veen



40h1.2tg2, NOHARATU
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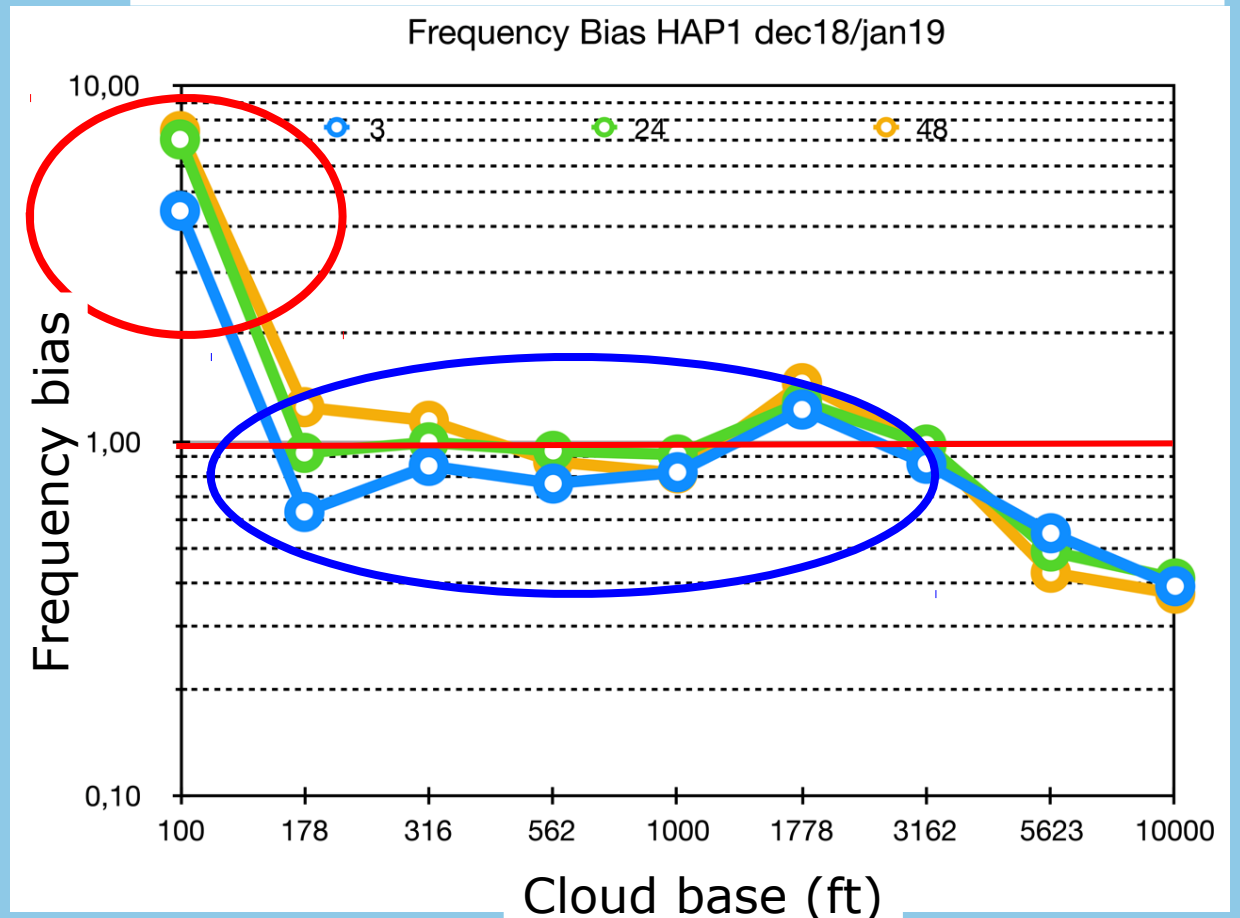

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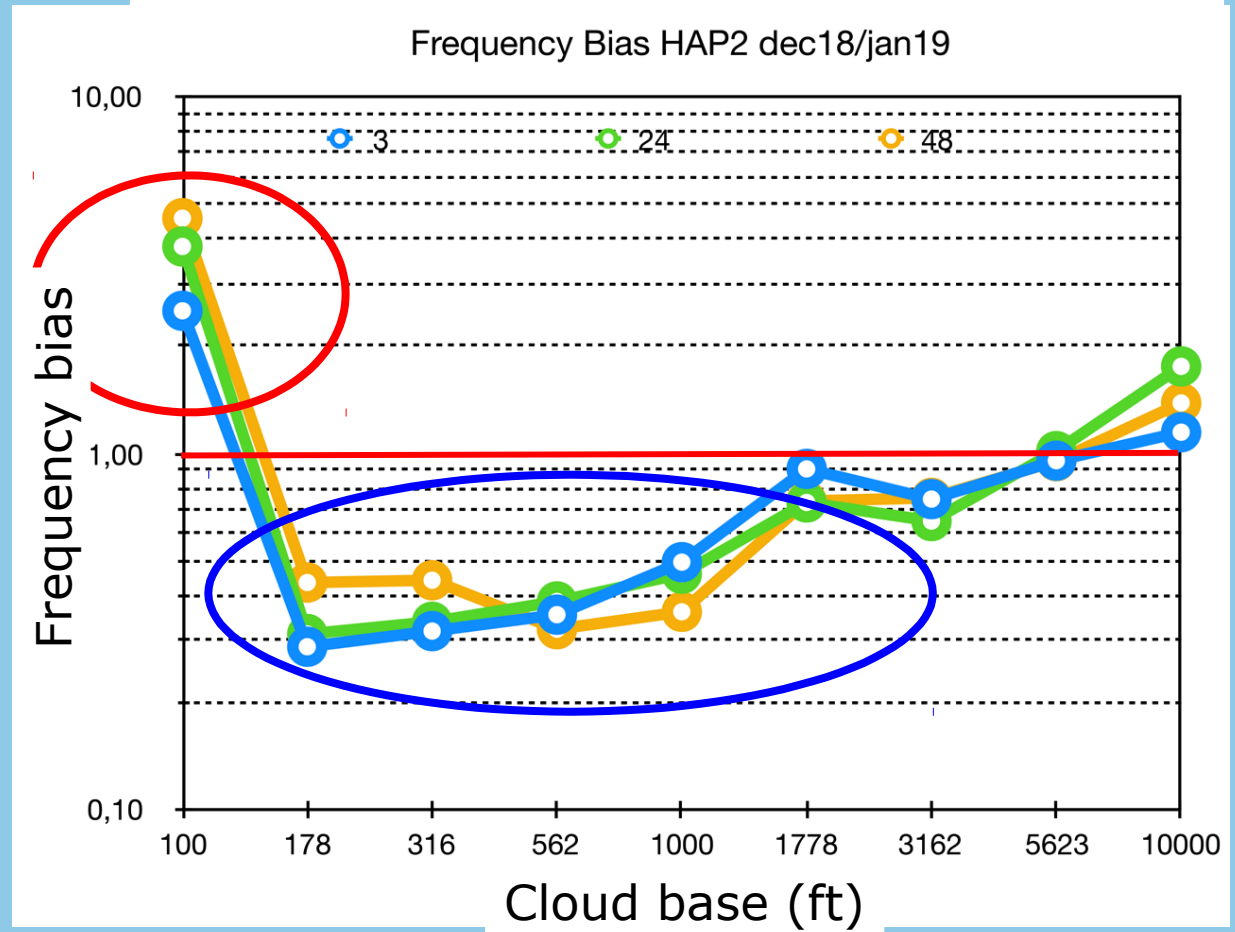
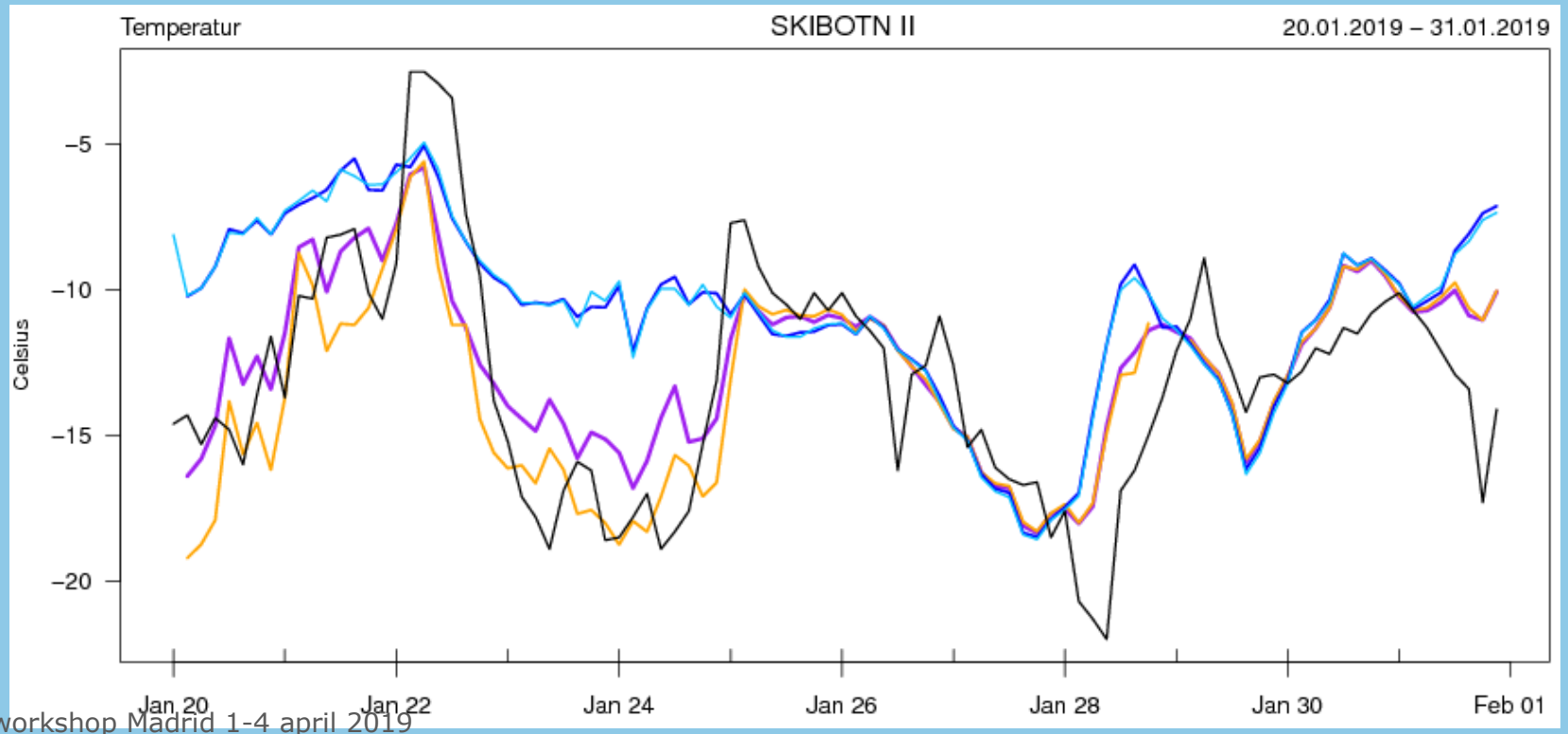
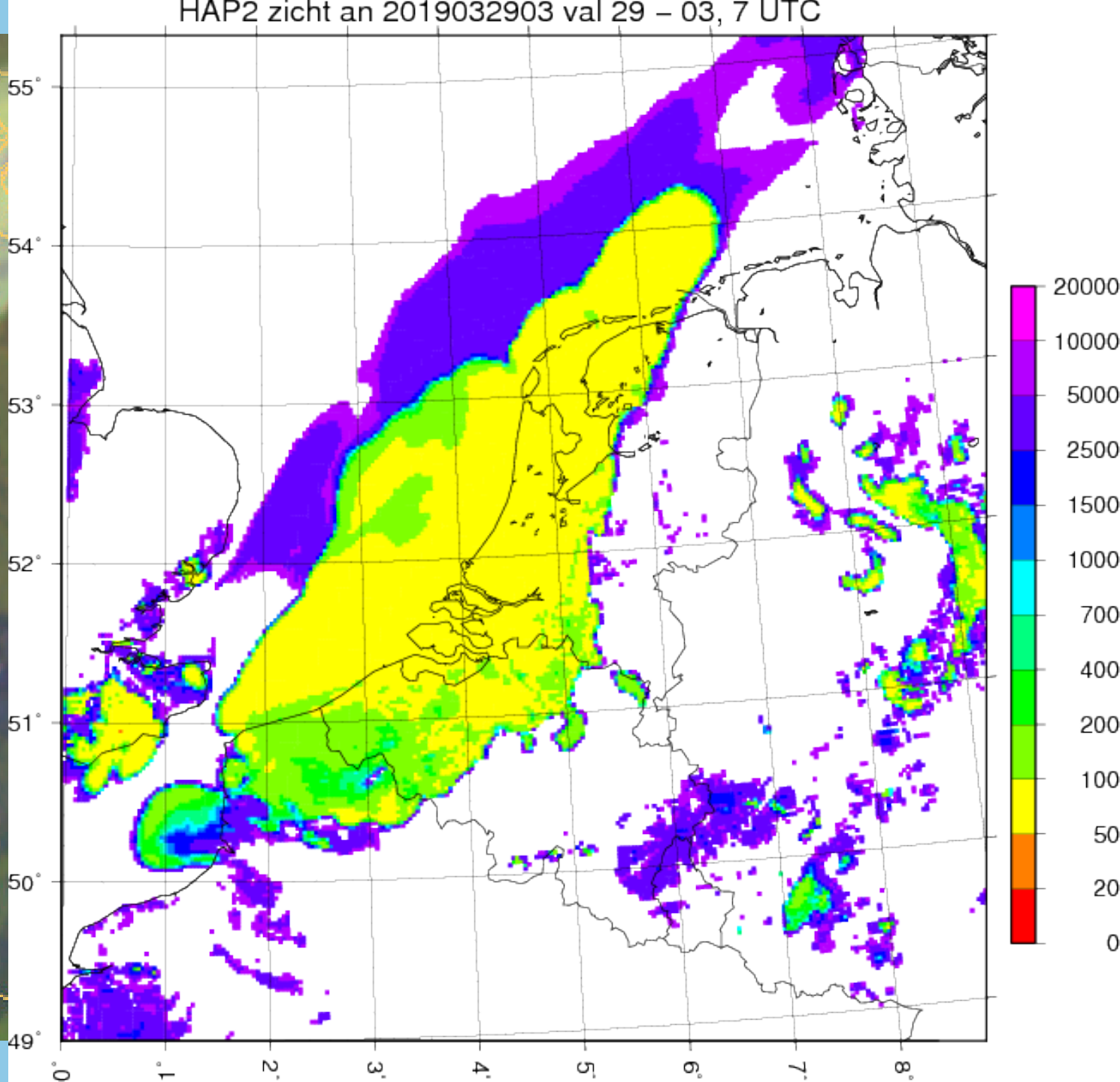


Surface fluxes, impact on stable boundary layer

- Impact XRIMAX on surface fluxes
- Current setting 0.0
- With 0.2 or 0.5 much lower temperatures in model possible than reference, better representation of very cold stable boundary layers

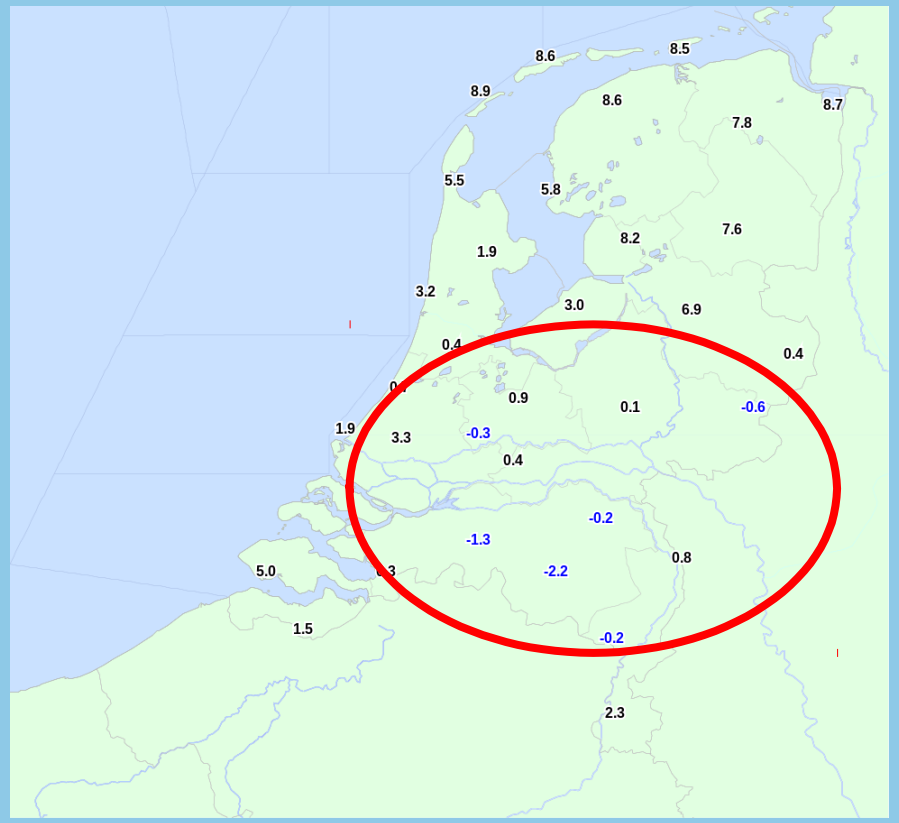


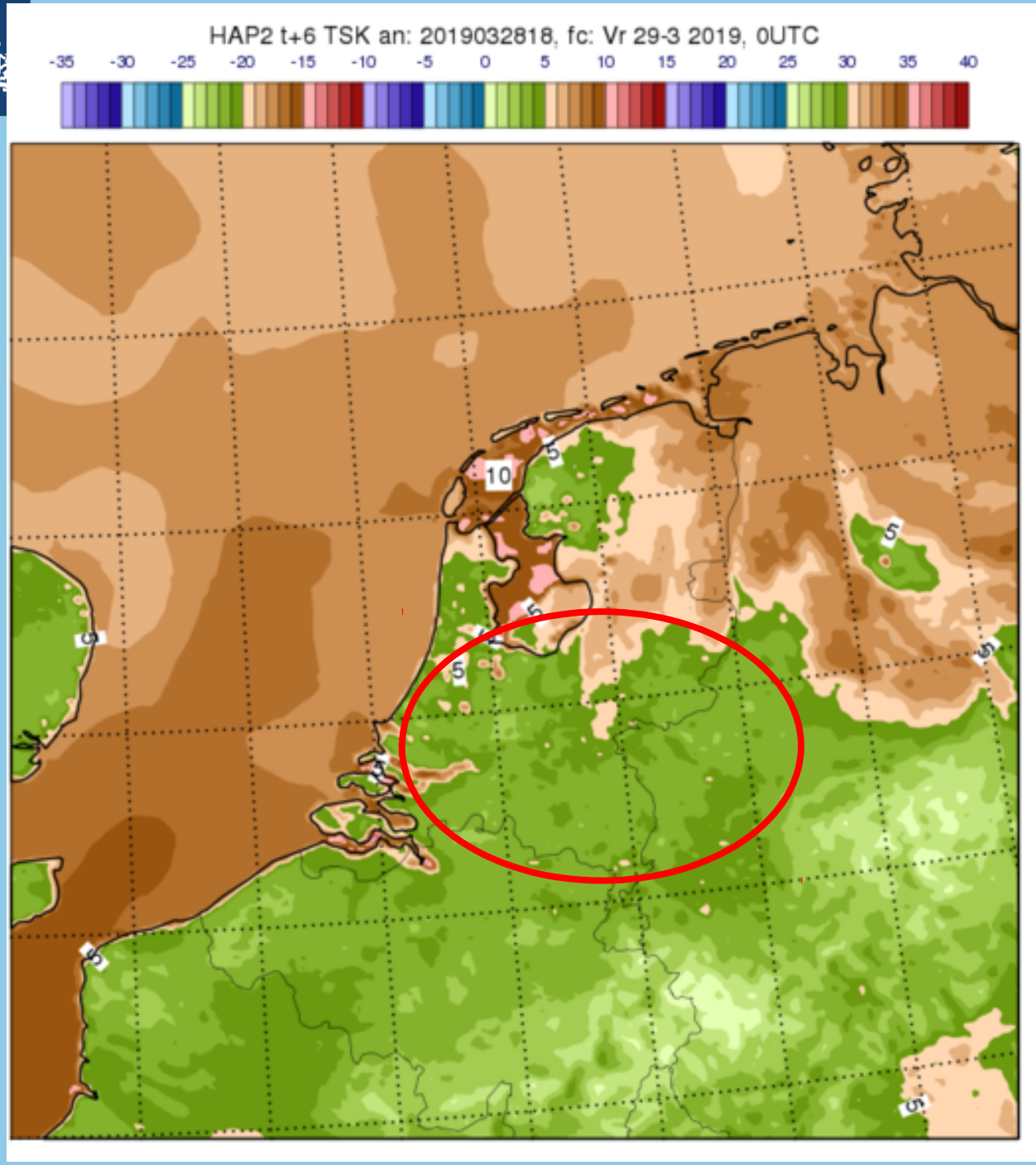
Mariken Homleid


HAP2 zicht an 2019032903 val 29 – 03, 7 UTC
55°
54°
53°
52°
51°
50°
49°
0°
1°
2°
3°
4°
5°
6°
7°
8°
20000
10000
5000
2500
1500
1000
700
400
200
100
50
20
0

Surface fluxes, impact on stable boundary layer

- Impact XRIMAX on T_opp and fog formation?





Conclusions

- Update HARATU 1 (daily cycle of shallow convection) and 2 (bias low clouds)
- Convection may also be improved by HARATU update 2, too dry PBL-top cause of some missed deep convection
- Open cell moderately cold convection only possible with shutting down shallow convection scheme. Do this dependent on forecasted depth of clouds and possible solid precip?
- Stable boundary layer strongly impacted by surface fluxes and XRIMAX. Impact of XRIMAX on overestimation of fog?