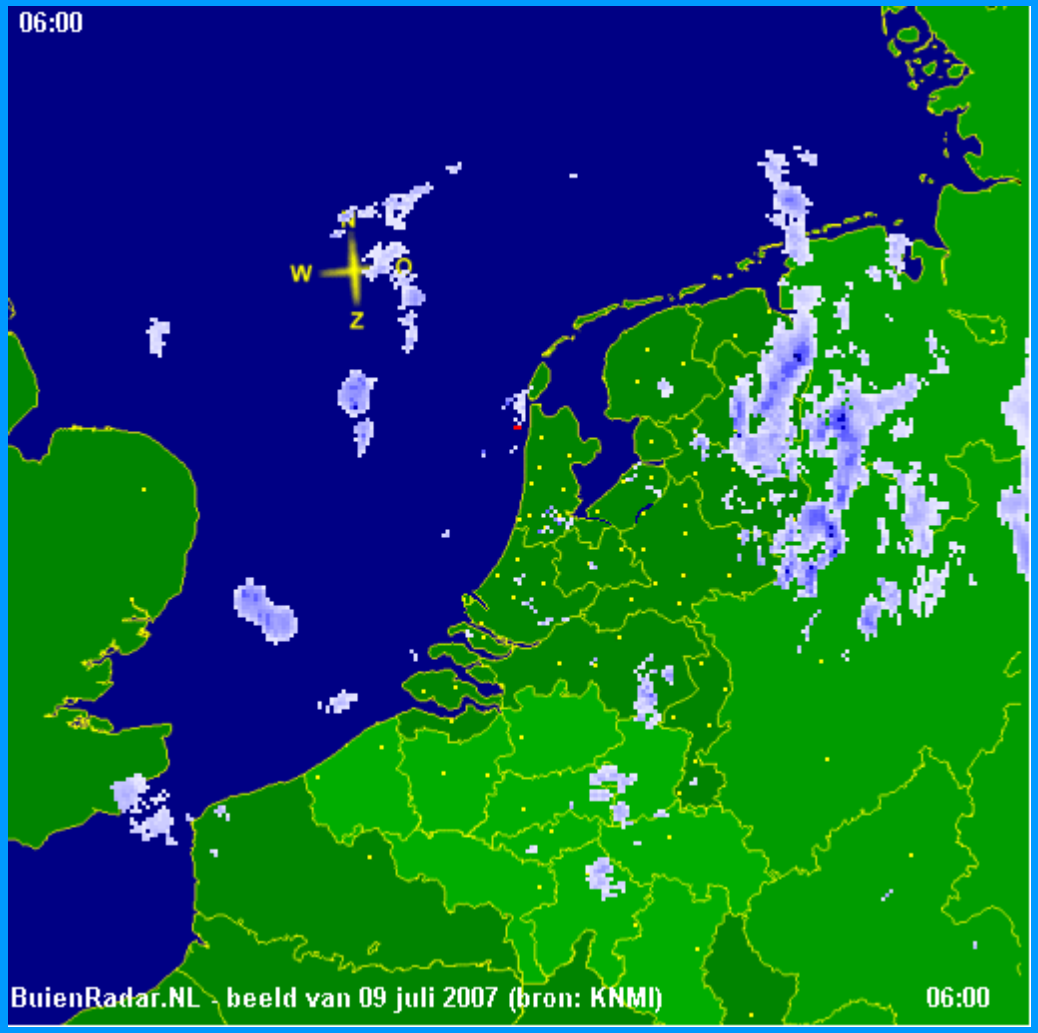
Experience with a strong outflow case in HARMONE

ALADIN/HIRLAM meeting
12–15 May 2009

Jan Barkmeijer
KNMI

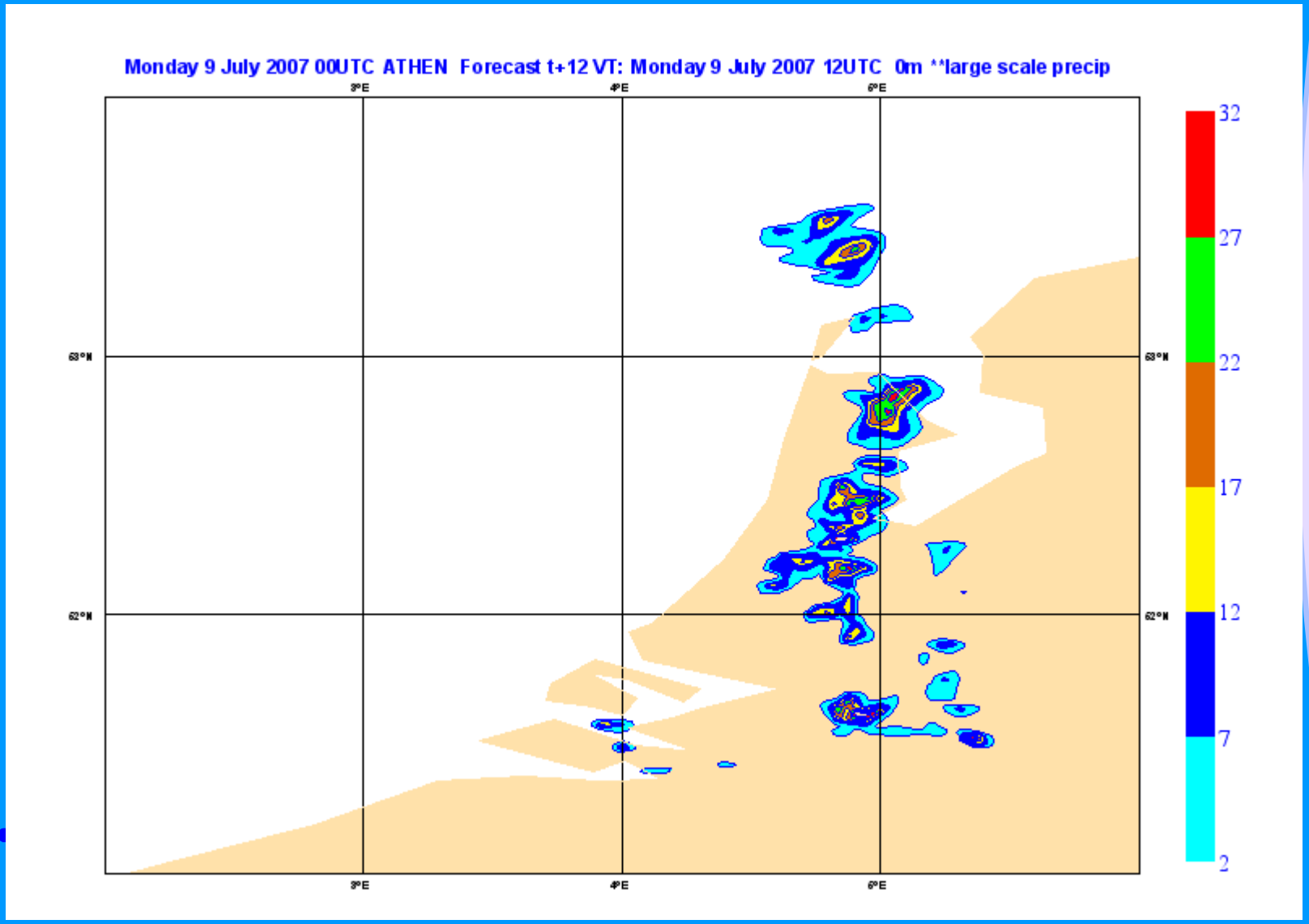
Acknowledgements: Lisa Bengtsson, Radmila Brozkova, Mariano Hortal, Sylvie Maradel, Toon Moene, Yann Seity, Sander Tijm

1 hour accumulated precipitation during 9 July 2007 6–14 UTC



Harmonie t+12h forecast from 2007070900

- 33h1 nested in Hirlam
- L40, grid=2.5km, area=120x100 (lat-lon)



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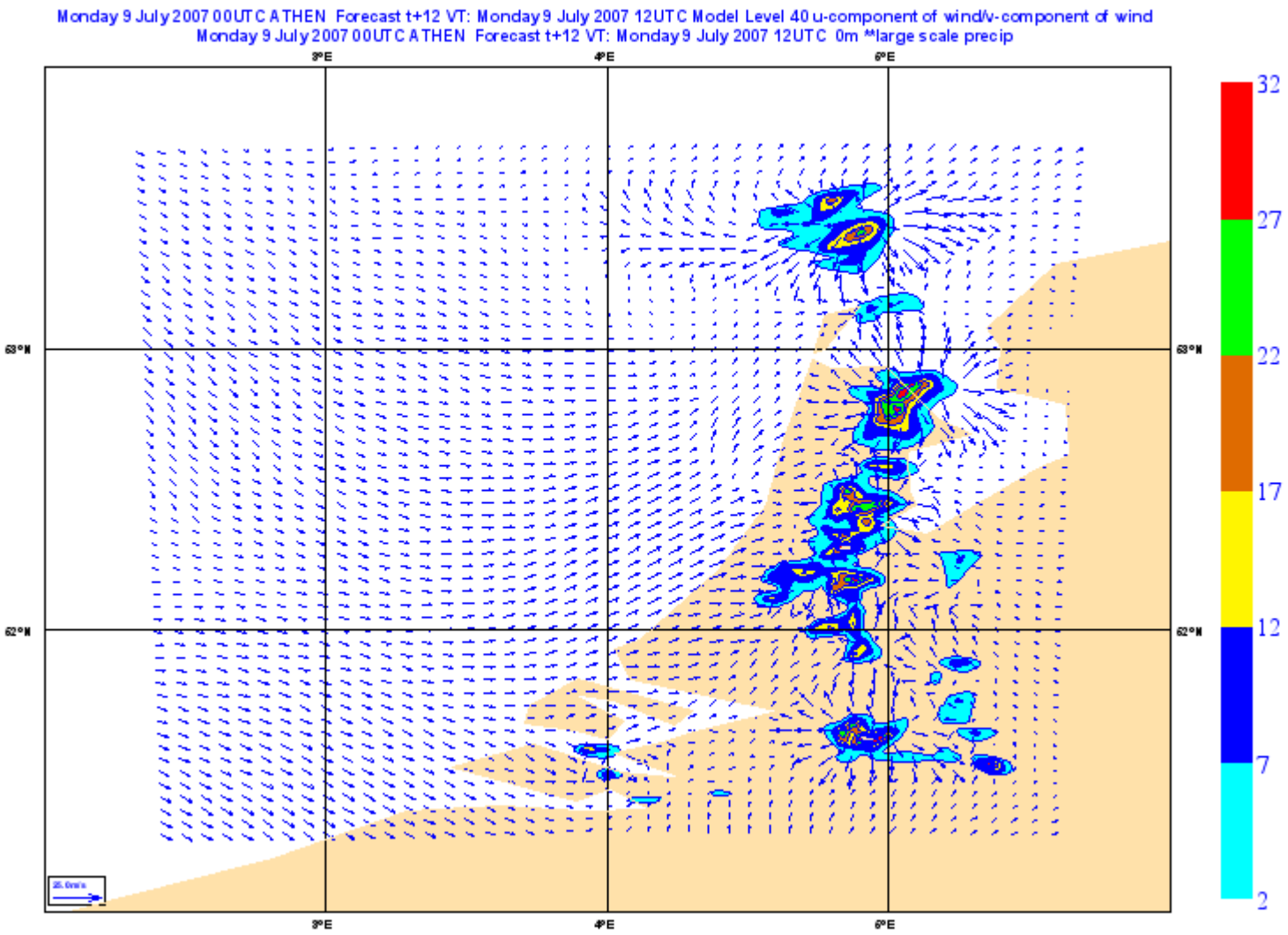
S trong outflow



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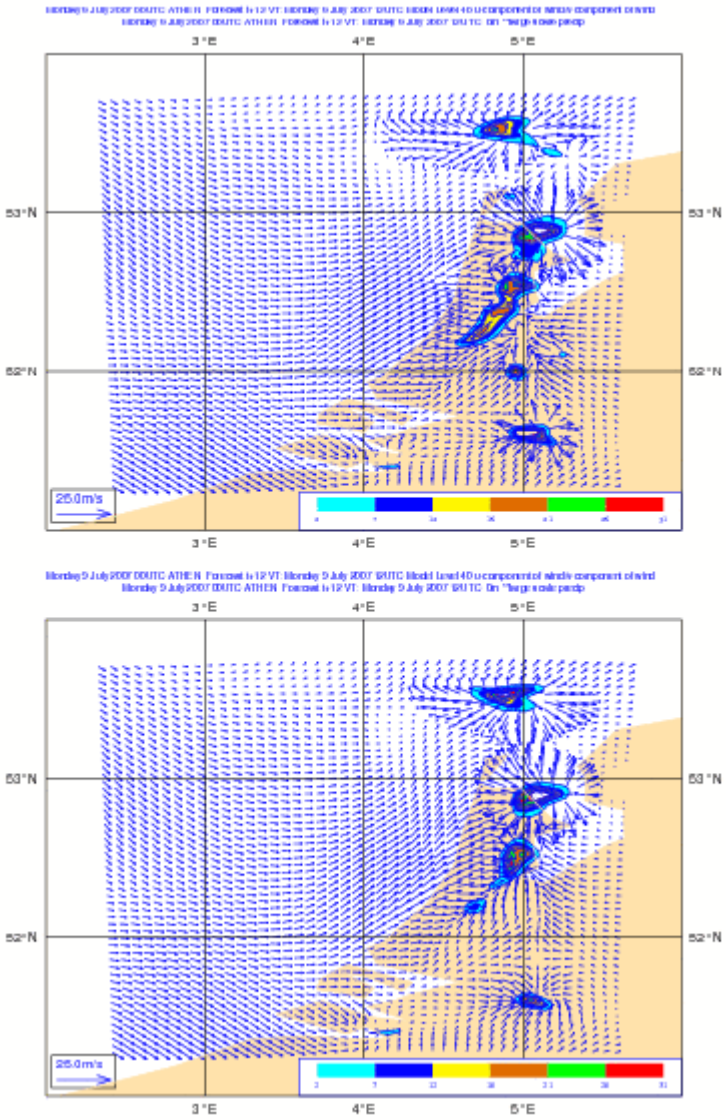
Impact of horizontal diffusion

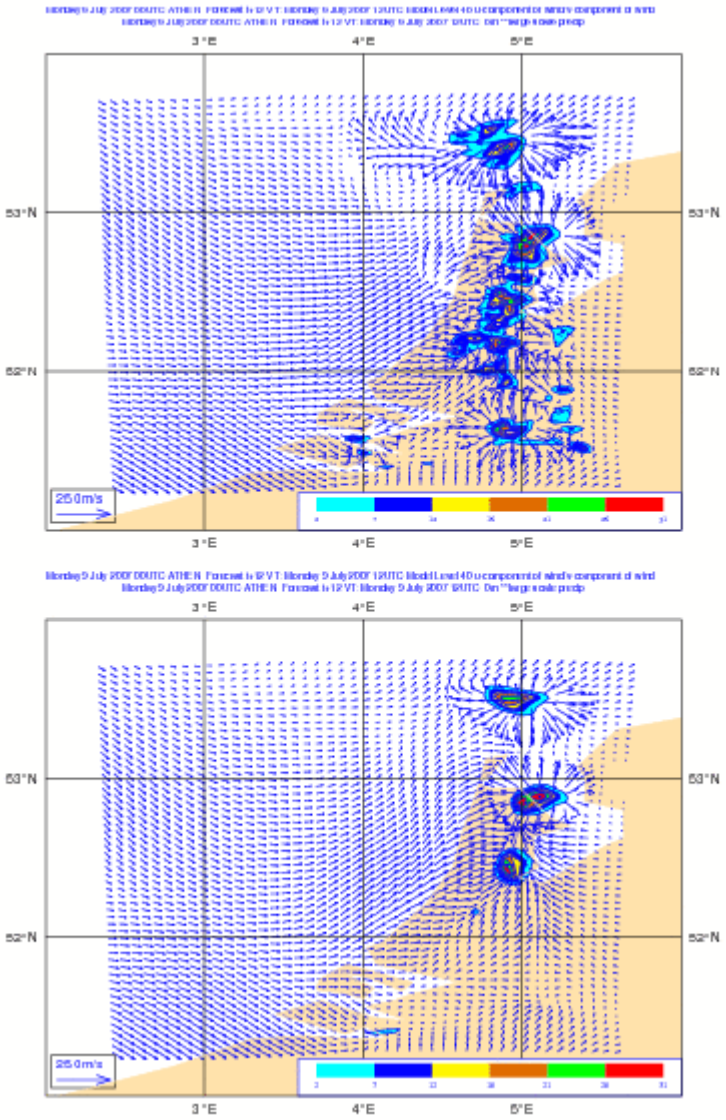
	32h3	33h1	HIGH1	HIGH2
[illegible]	5	20	0.5	0.2
[illegible]	1	20	0.5	0.2
[illegible]	5	20	0.5	0.2
[illegible]	5	20	0.5	0.2
[illegible]	1	20	0.5	0.2
[illegible]	5	200,000	200,000	200,000

N.B. Lower values > Higher diffusion

32h3

33h1





HIGH 1

HIGH 2

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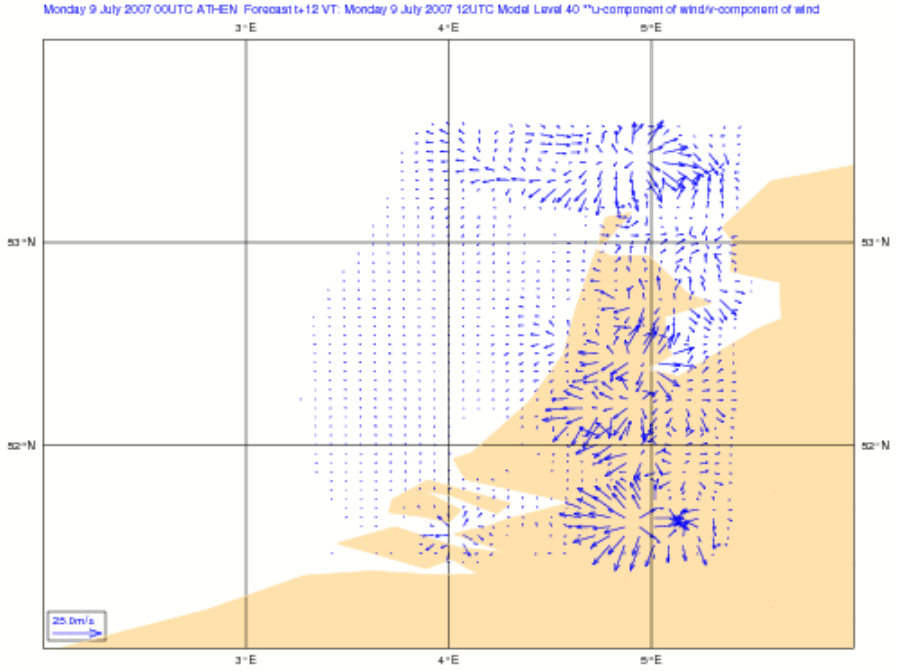

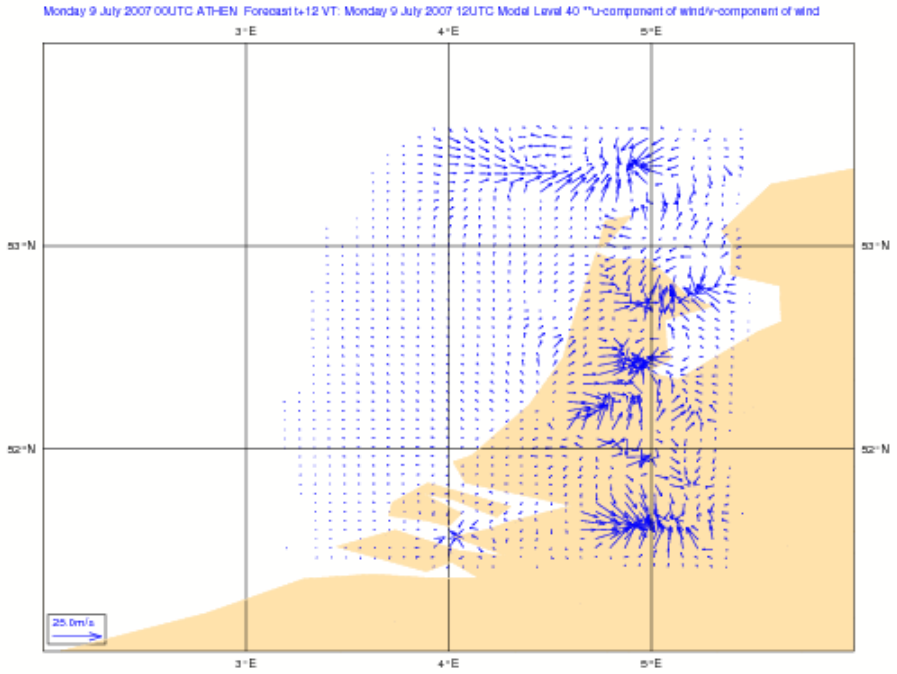

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difference plot L40 windvector

33h1 – *32h1*

HIGH 1 – *32h1*

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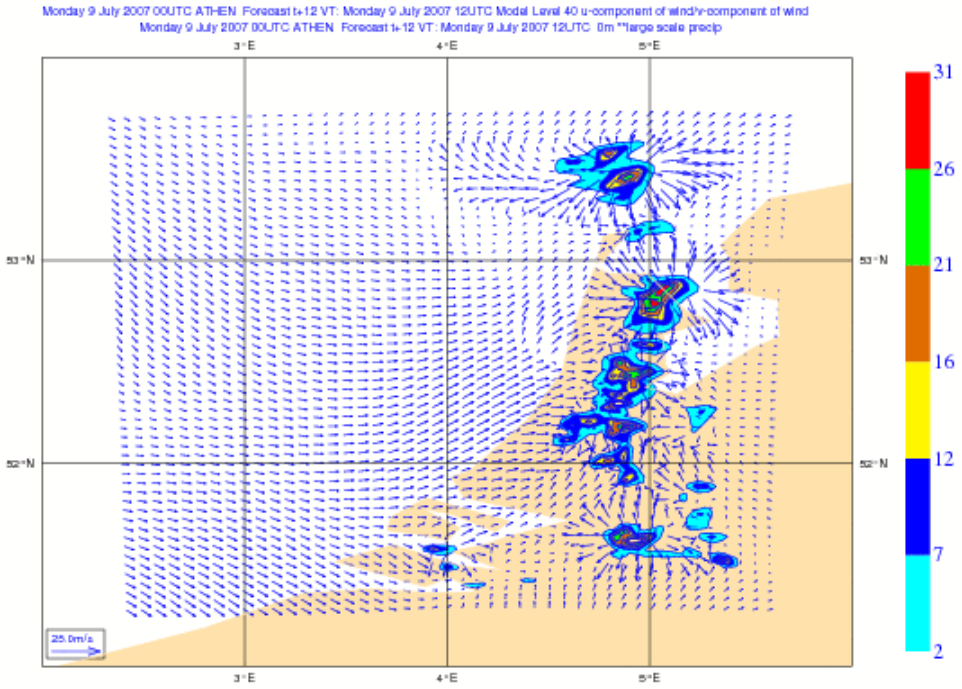

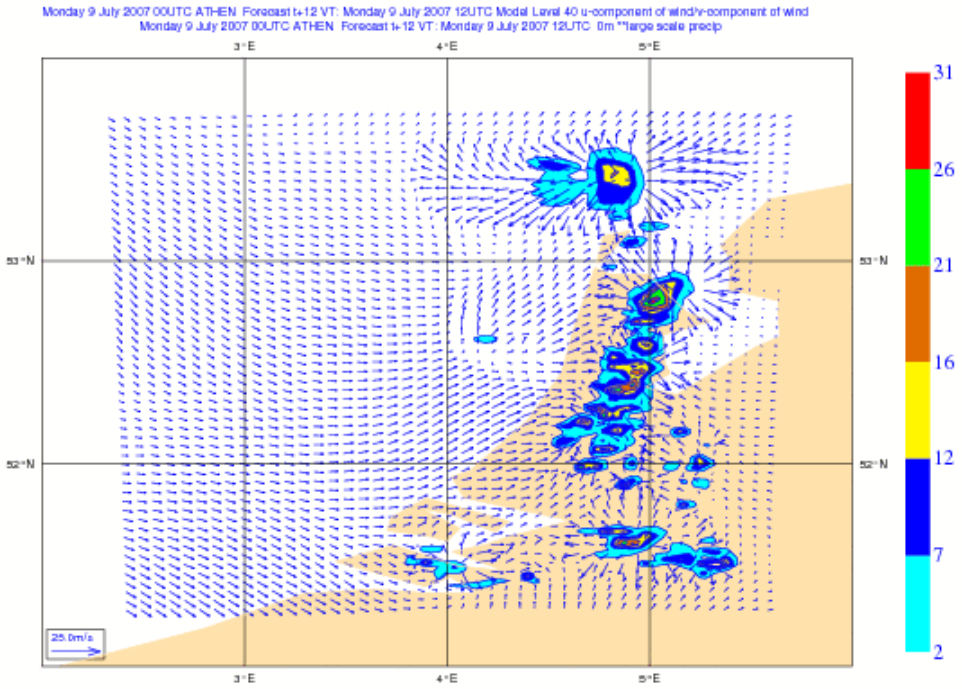

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33h1

All diffusion values set to 200,000 (no diffusion case)

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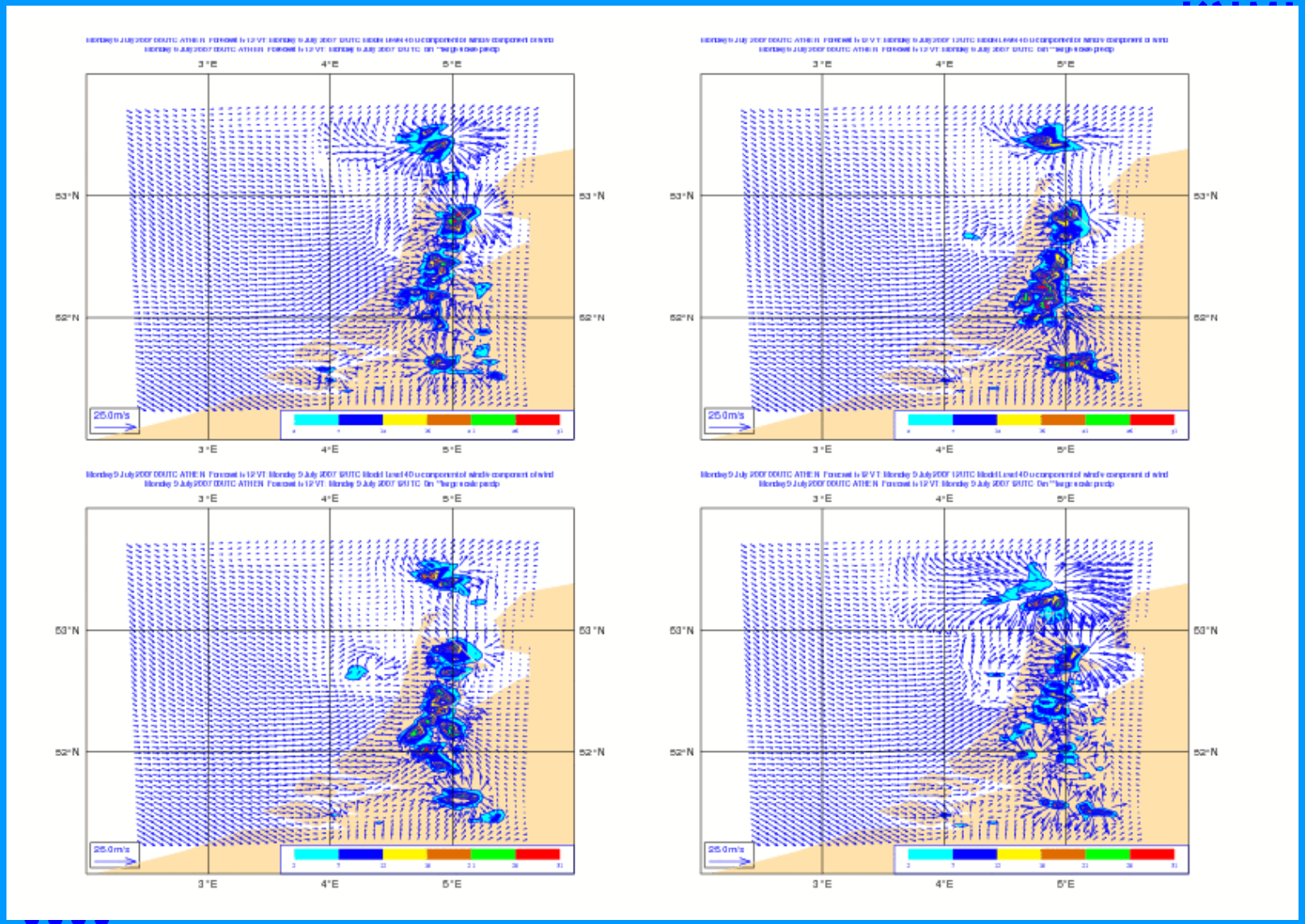
Impact of evaporation

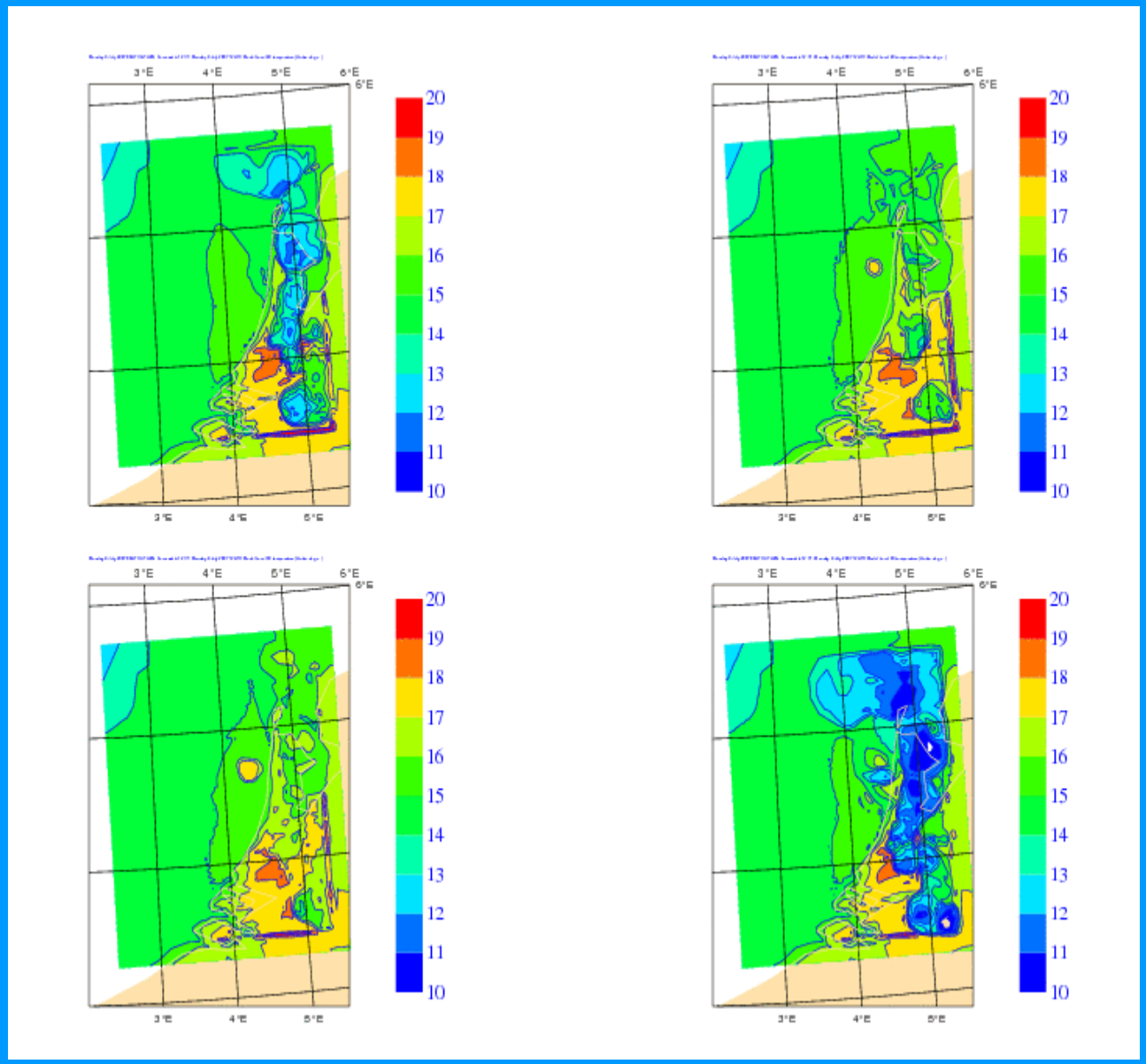
33h1 evap/10



No evaporation evap*10

Impact of evaporation (2)

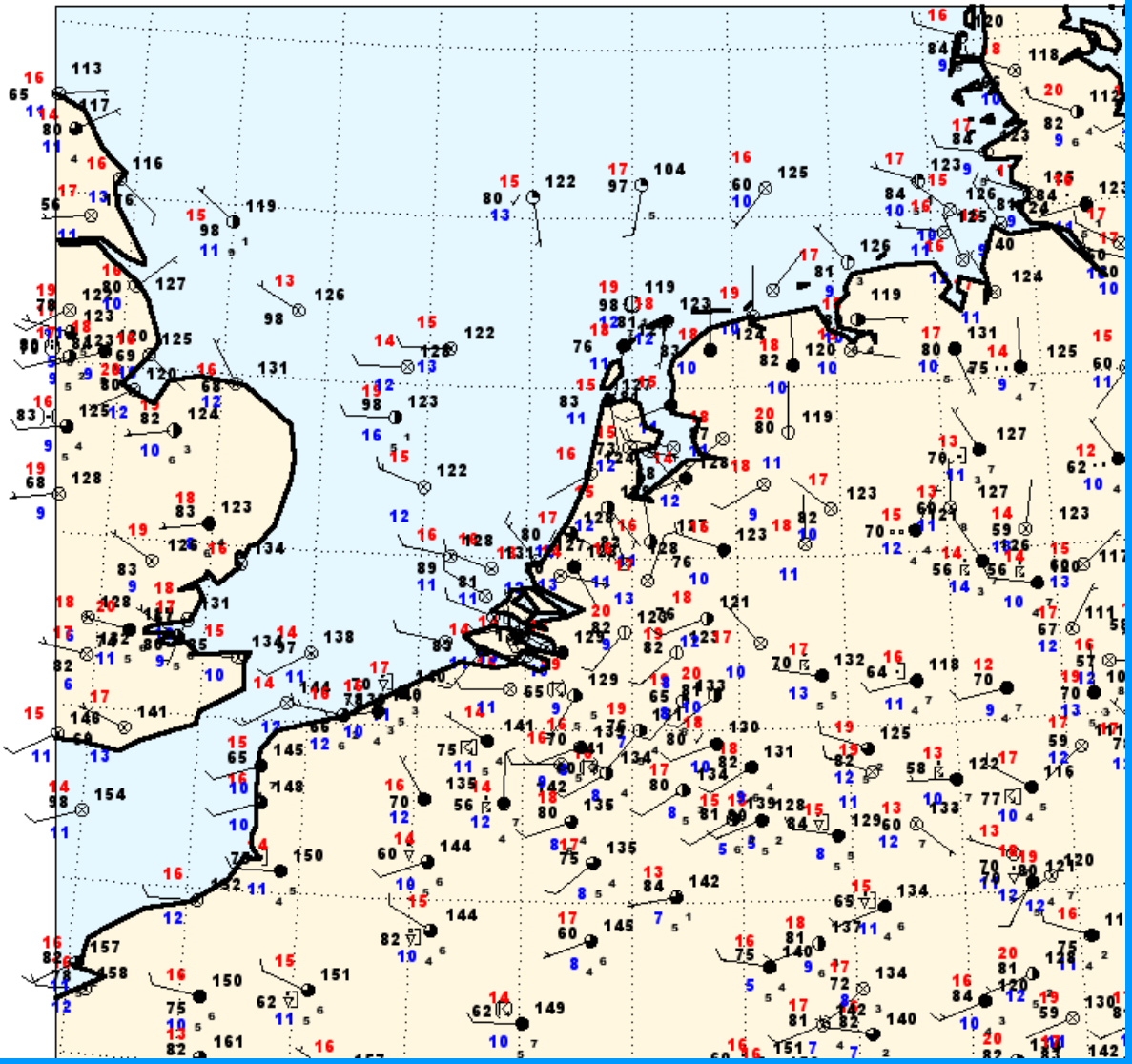
33h1 evap/10



L40
temperature

No evaporation evap*10

Observations on 20070709 at 12 UTC



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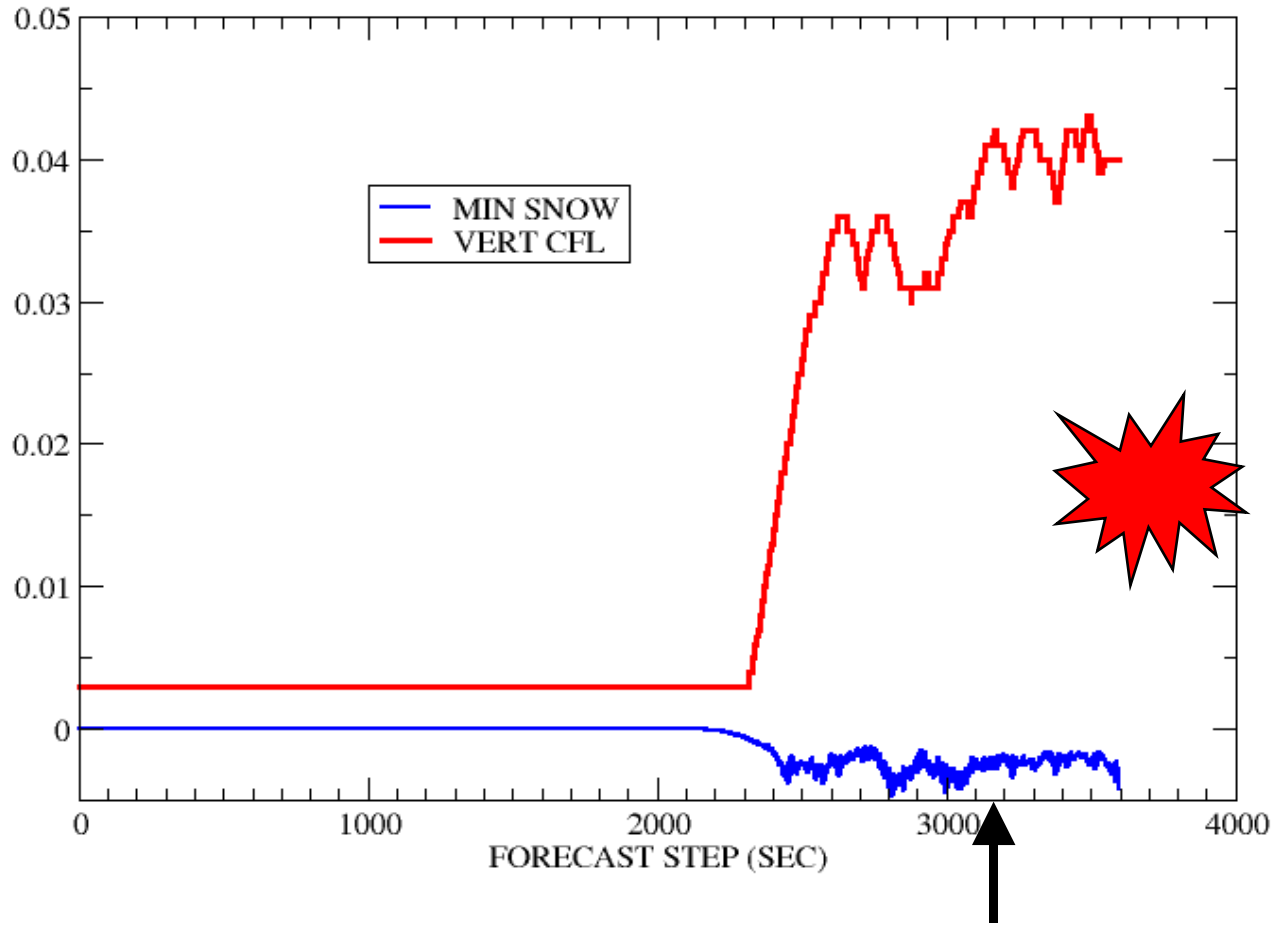
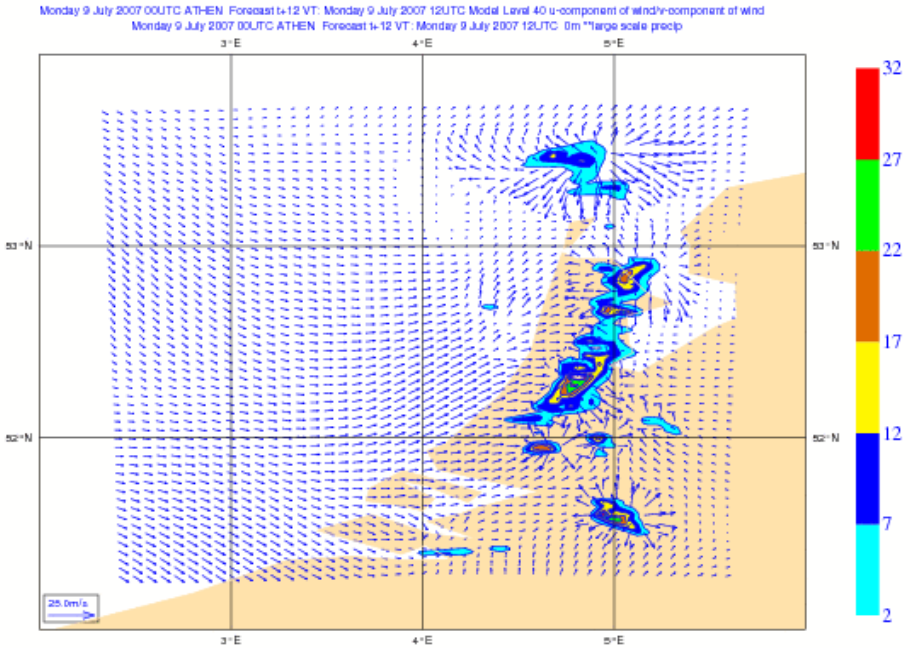
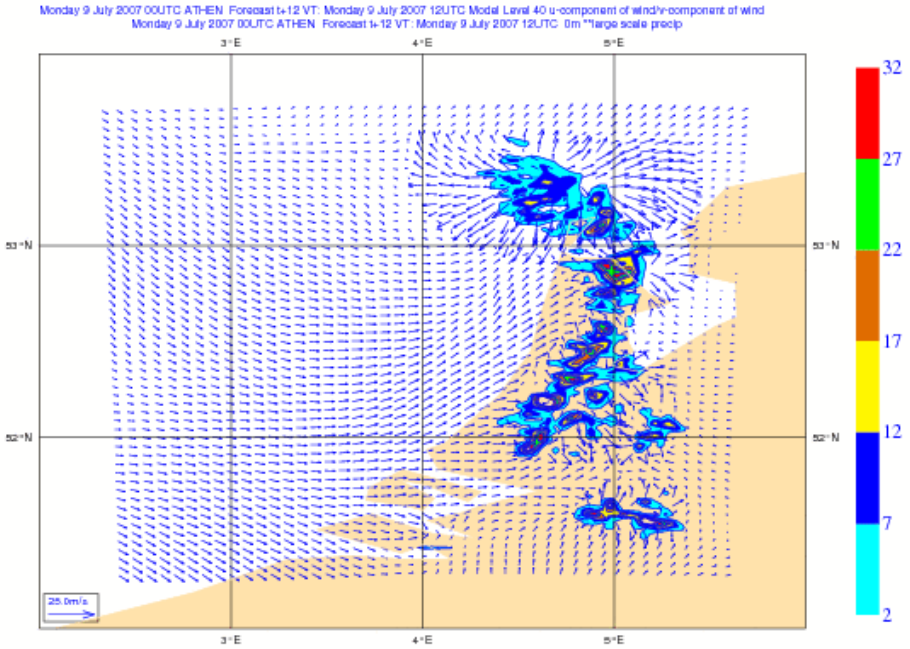
Eulerian run with 33h1



Negative values for snow/rain/graupel





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35h1

Eulerian

T imestep=10 s

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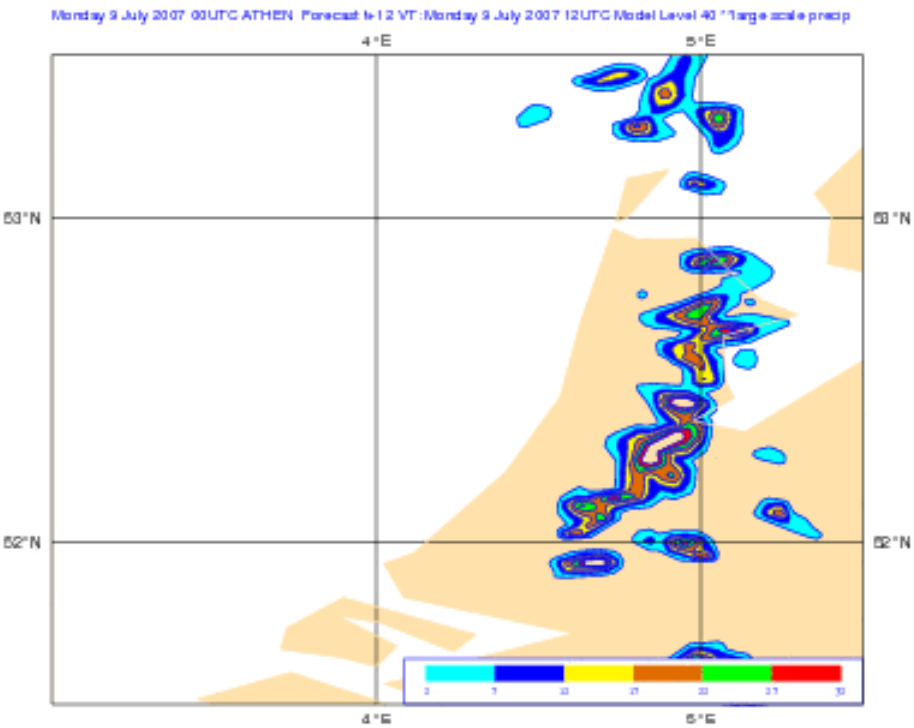
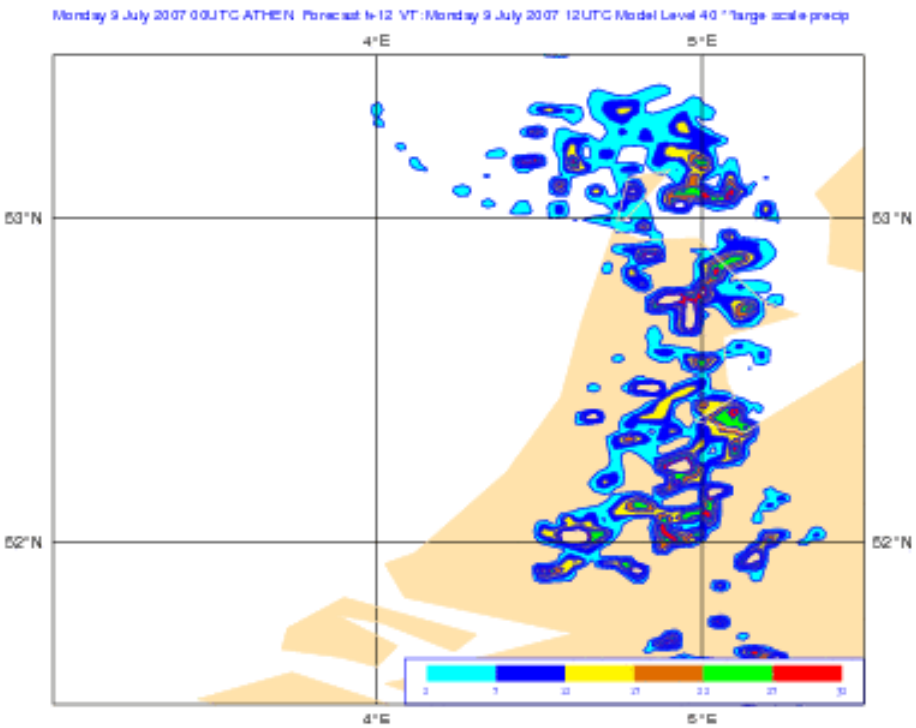
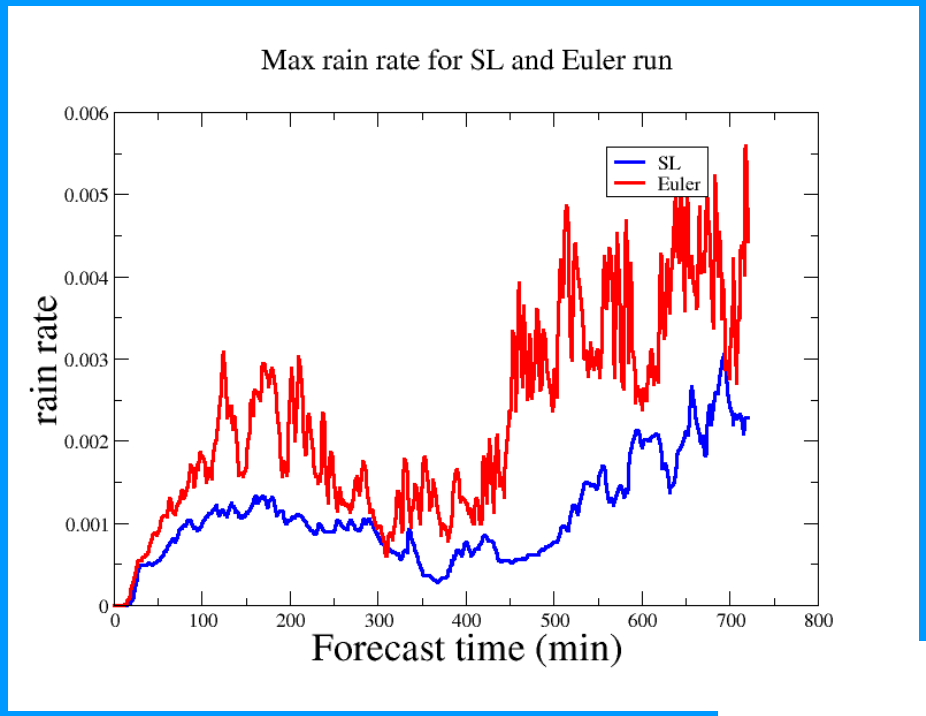
Eulerian: more granular, small-scale structures in rain rate

35h1 SL



Eulerian





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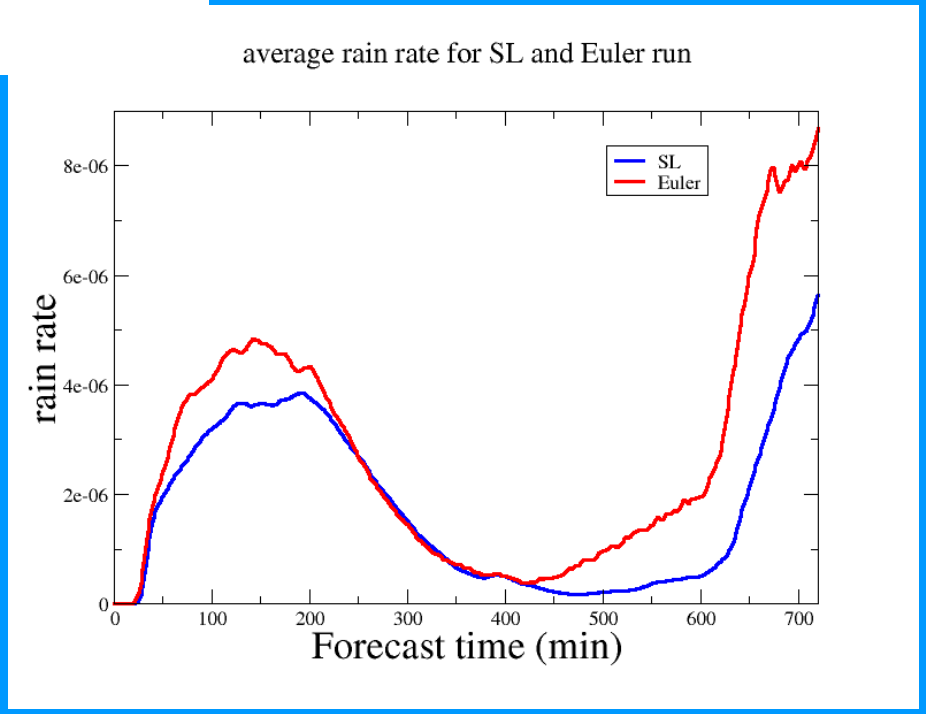
Eulerian:

Also more intense precipitation



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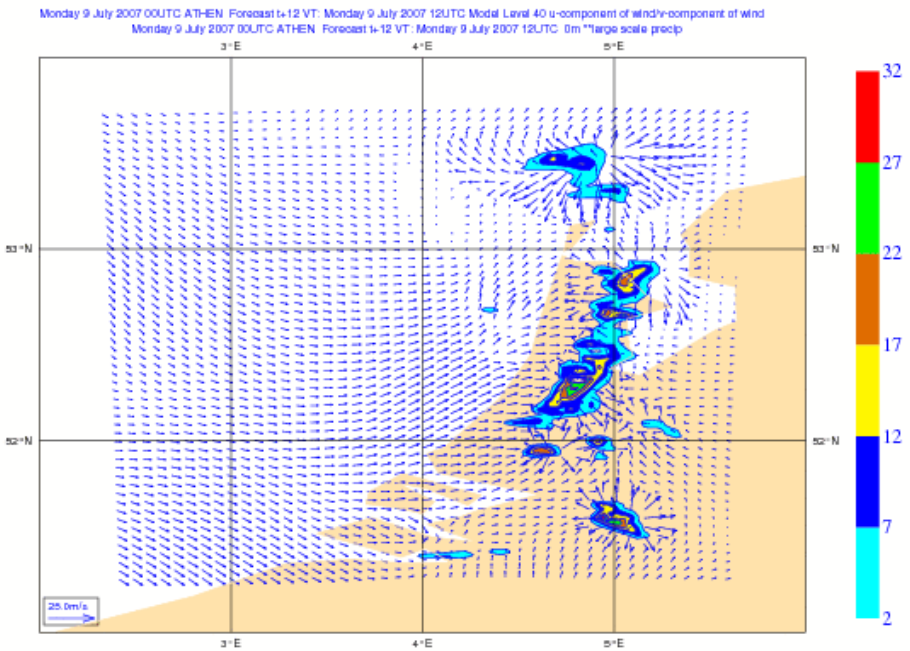

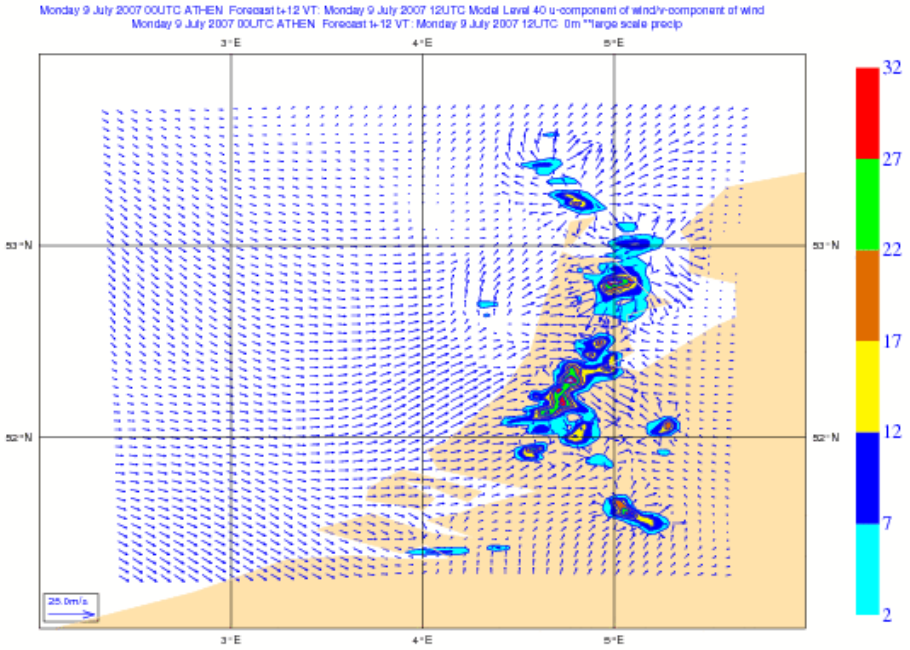

35h1 SL default setting

35h1 SL but with Eulerian setting, in particular:

No advection of hydrometeors, apart from q

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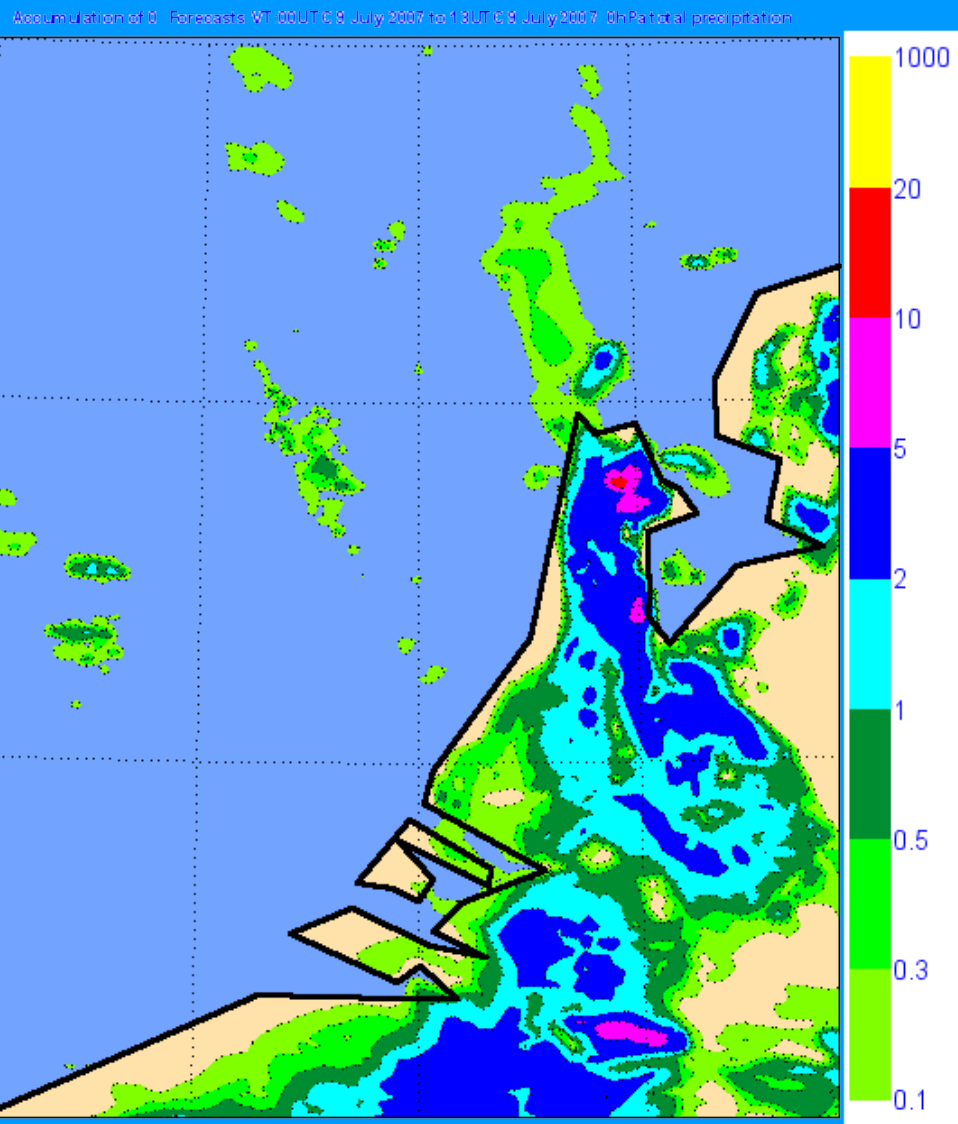
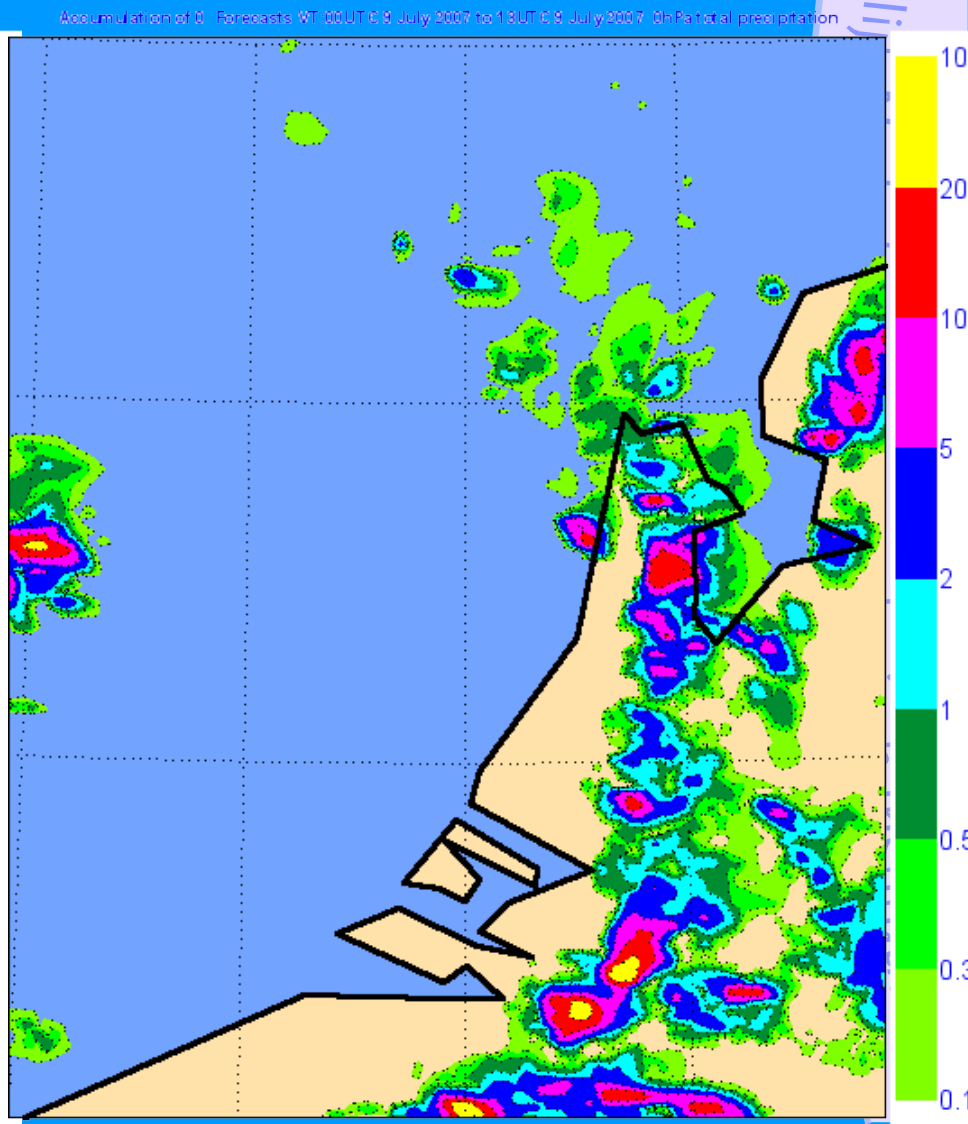
2.5km Harlam runs

....

Default



NoKain-Fritsch



KNMI

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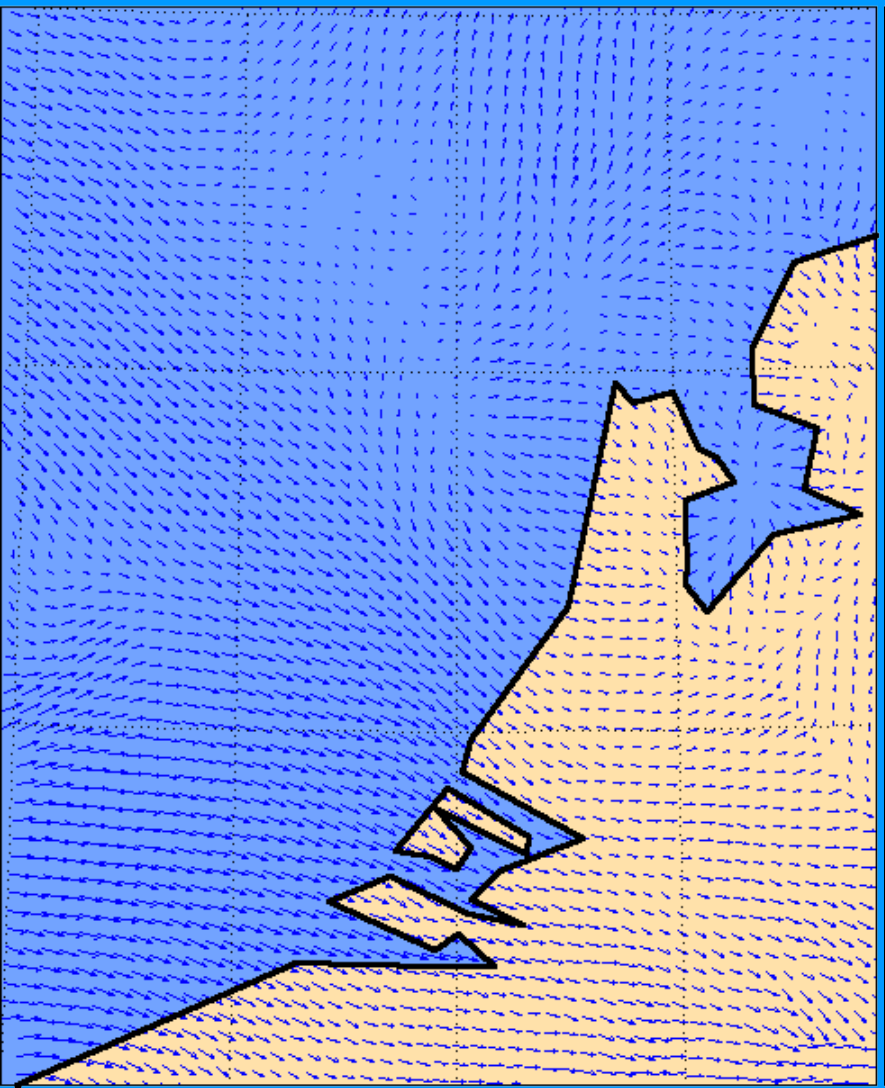
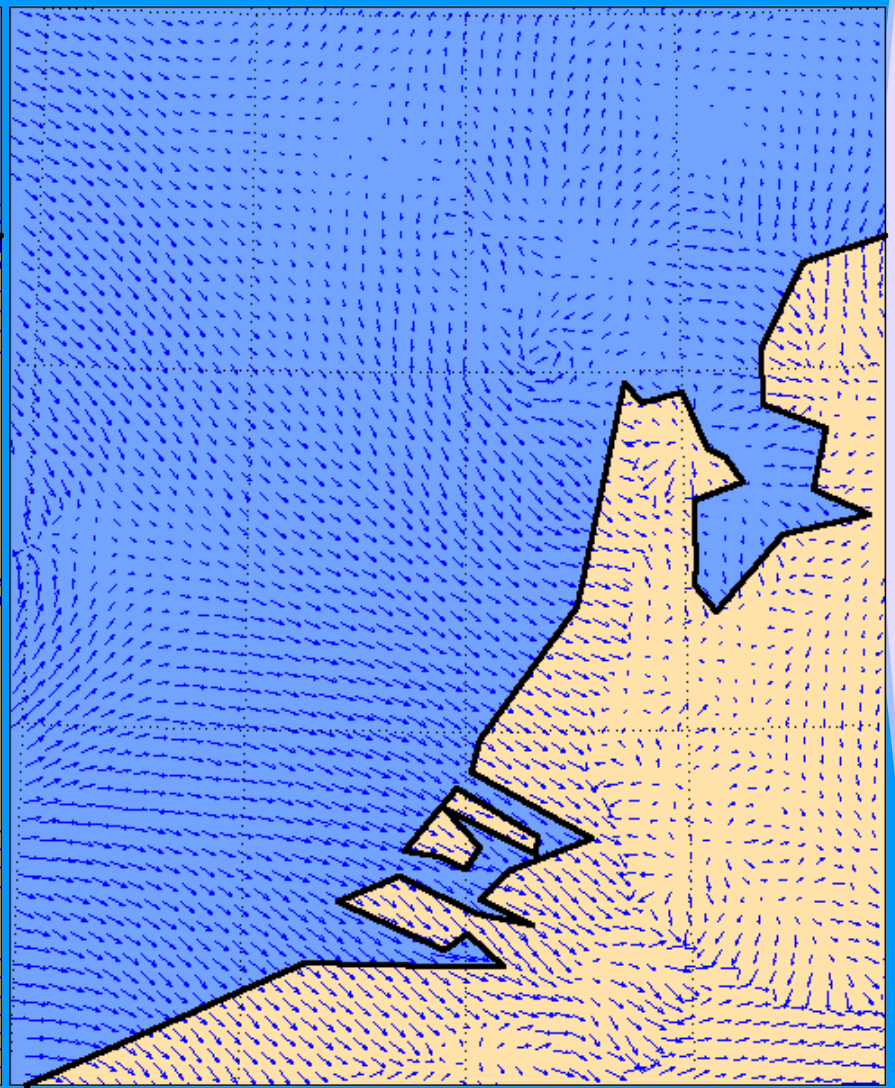
Default

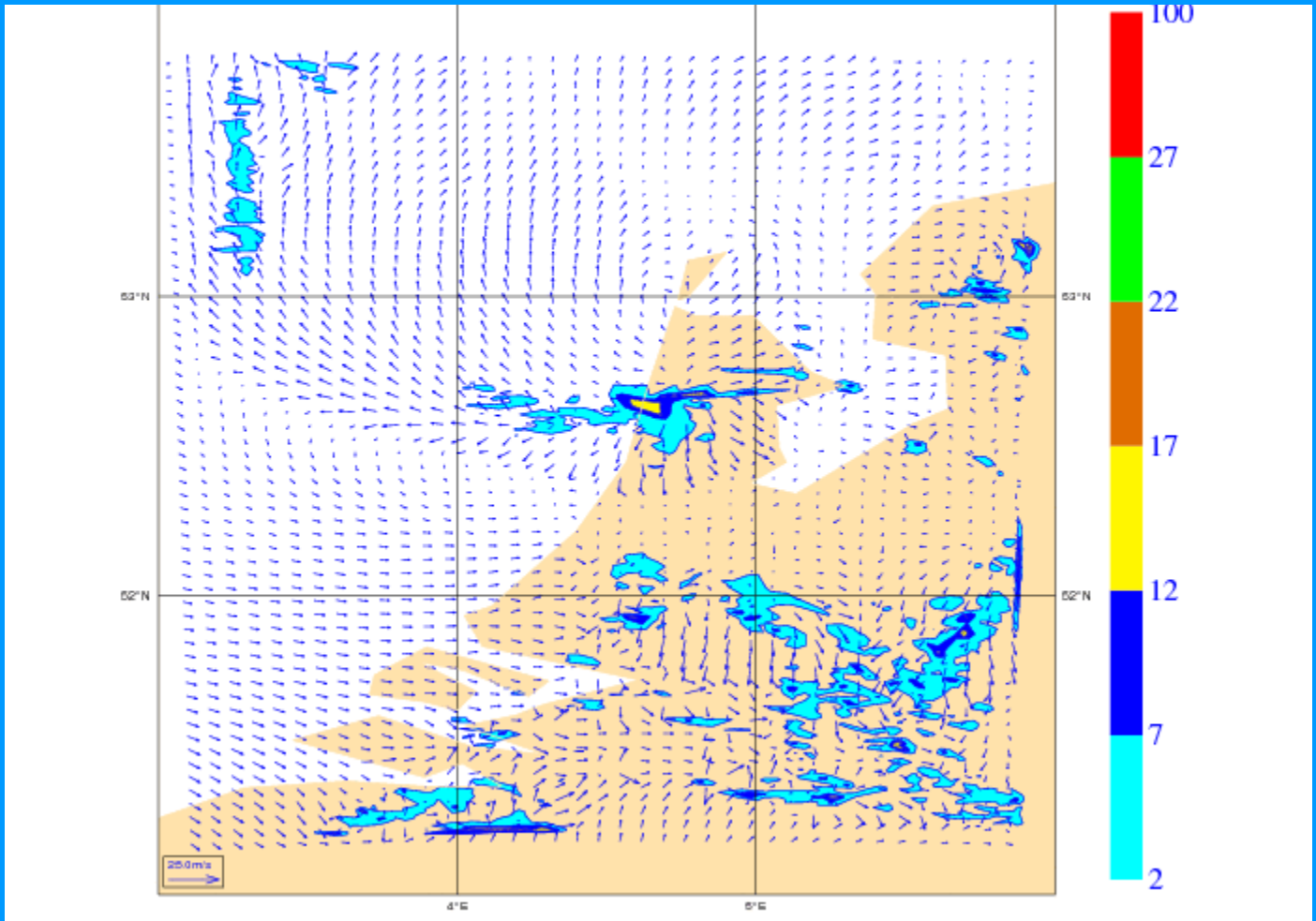


NoKain-Fritsch

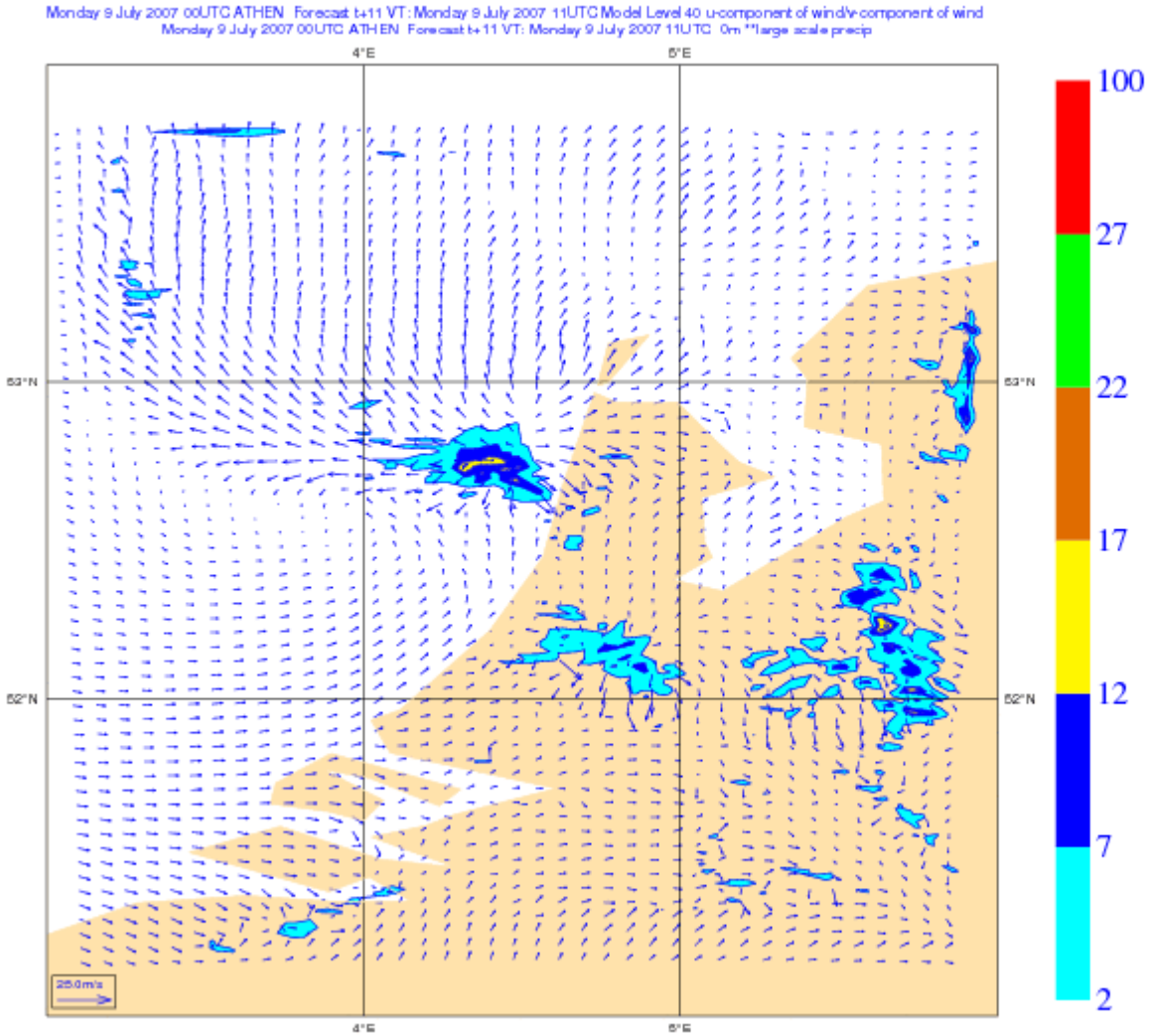


500m Harmonie run

- timestep=10s
- specialnamelist to prevent instabilities



t+11h forecast from 20070709 00UTC



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CONCLUSIONS

- Decreasing (increasing) horizontal diffusion seems to increase (decrease) the extent of the outflow.

- Modifying evaporation yields stronger (weaker) outflow when increased (decreased)

- Eulerian run shows larger outflow (less diffusive), and a distinctively different rain pattern than the SL run: more small-scale structures and more intense.

- SL run with advection of hydrometeors switched off (apart from specific humidity q, as in the Eulerian run) seems to weaken the outflow.

- Precipitation in the 500m run is strongly reduced and shows an entirely different wind vector pattern at t+12h, as compared to a 2500m run.