



ILMATIETEEN LAITOS
METEOROLOGISKA INSTITUTET
FINNISH METEOROLOGICAL INSTITUTE

Meso-scale numerical weather prediction

- **Meso-scale NWP modelling and verification**
- **Plans**
- **First results**

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Testbed Work Shop
FMI, Helsinki
6.4.2006



Meso-scale NWP modelling

- NWP work at FMI is done within the framework **HIRLAM-A** program.
 - ➔ Develop and maintain the "state-of-the-art" operational NWP model.
 - ➔ 2 operational suites at FMI: **HIRLAM-RCR (22km)** and **HIRLAM-MBE (9km)**.
 - ➔ Next step is to setup the semi-operational prototype model (**AROME**) with 2.5 km grid-size.



What about Testbed data?

- Models have to be **INITIALIZED**.
- Model components must be **EVALUATED** before the operative use.
- The overall performance of the whole NWP system must be objectively **VERIFICATED**.

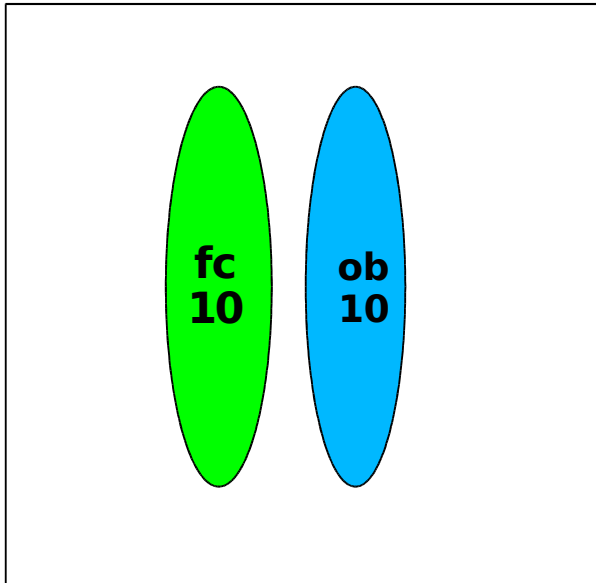


Plans related to Testbed

- Model the Testbed campaign periods:
 - ➔ Case studies (precipitation, stable boundary layer).
- Improve of the initial state of the model forecast by using the high resolution observations.
 - ➔ Doppler radial winds!
- Develop the new verification methods to be used on meso-scale.



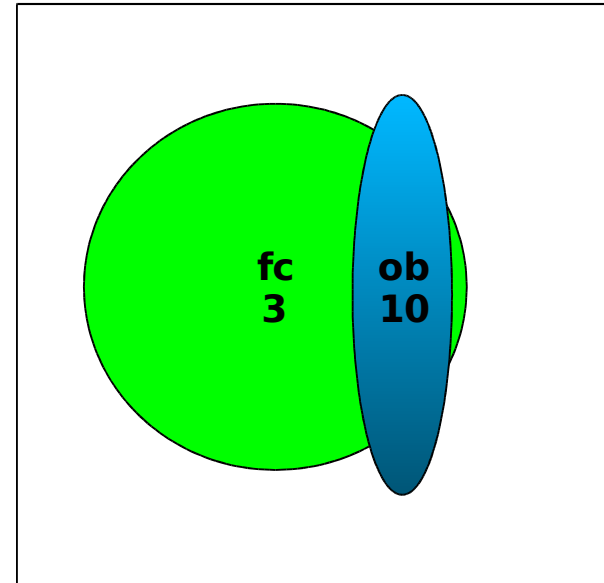
Entity based verification methodology



High resolution forecast

RMS ~ 4.7

POD = 0, FAR = 1, TS = 0



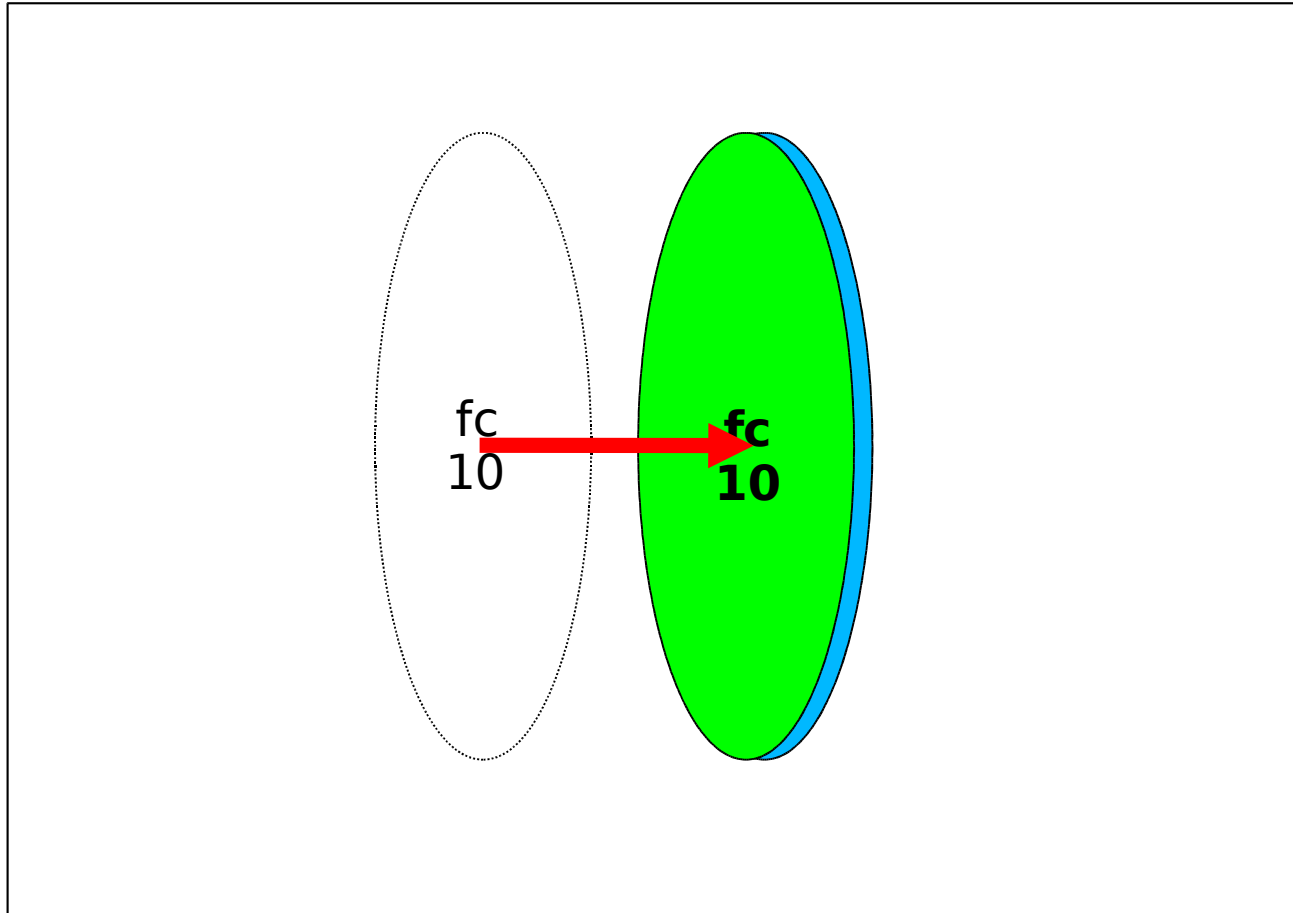
Low resolution forecast

RMS ~ 2.7

POD ~1, FAR ~0.7, TS ~0.3



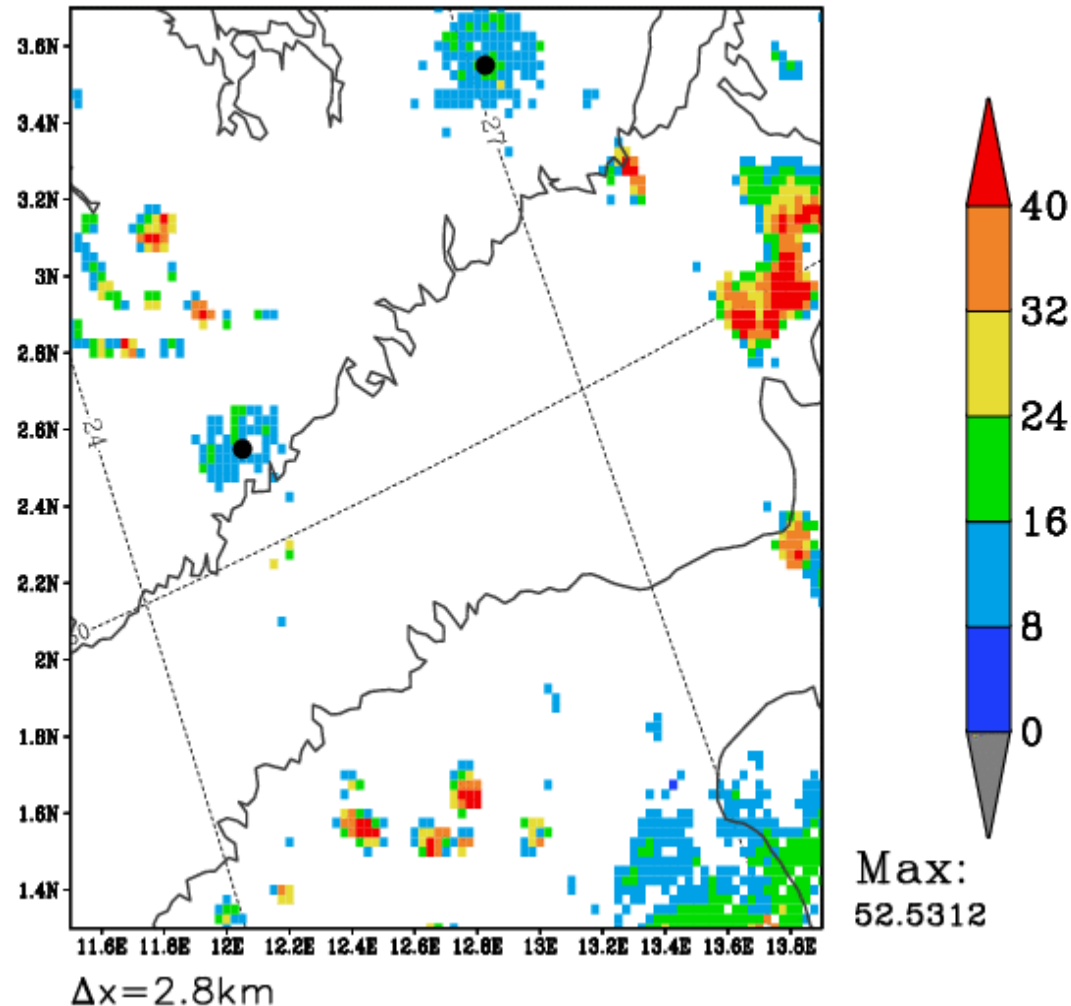
Entity based verification methodology





Case study 9.8.2005 (Helsinki Athletics WC)

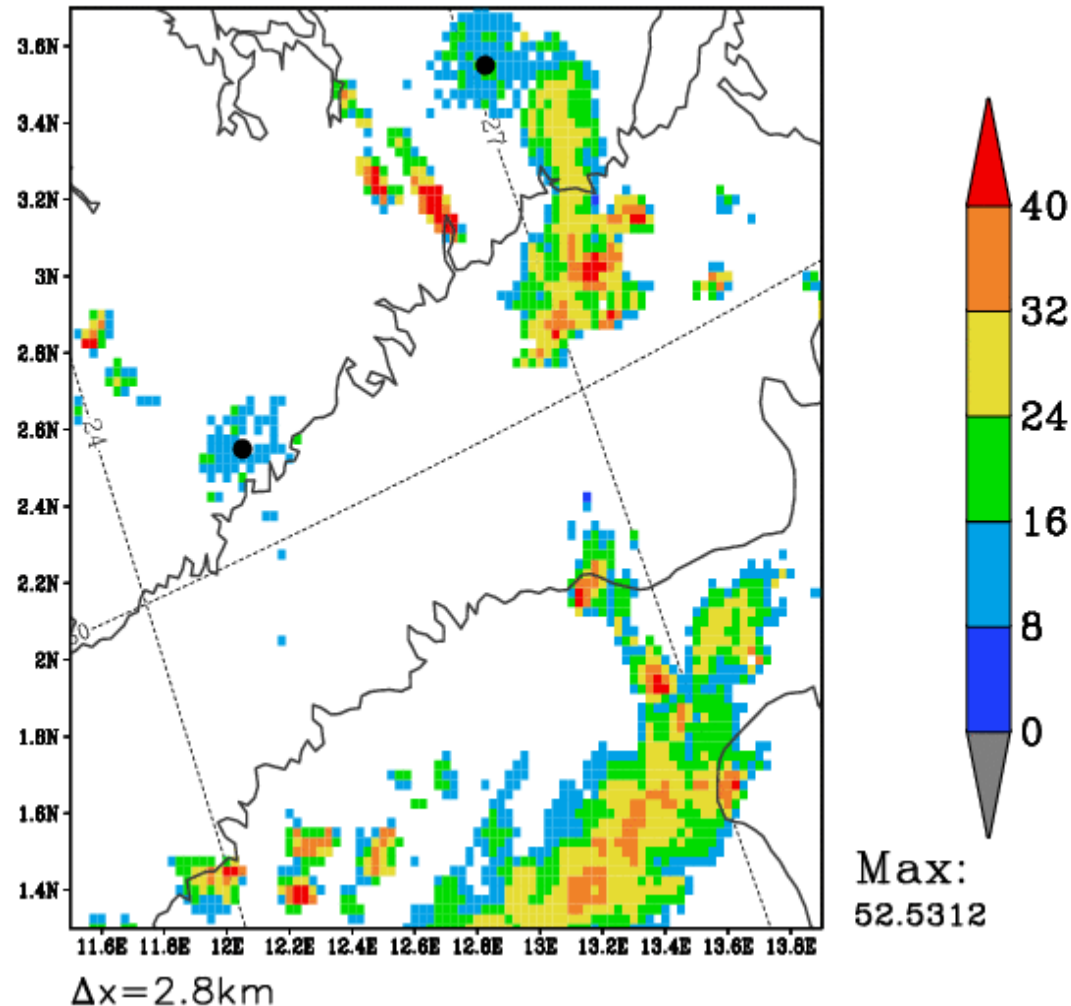
Observed radar reflectivity [dBZ], antenna 0.8°.
VT: 09AUG2005 12 UTC. Rad: KOR, VAN, ANJ, IKA





Case study 9.8.2005 (Helsinki Athletics WC)

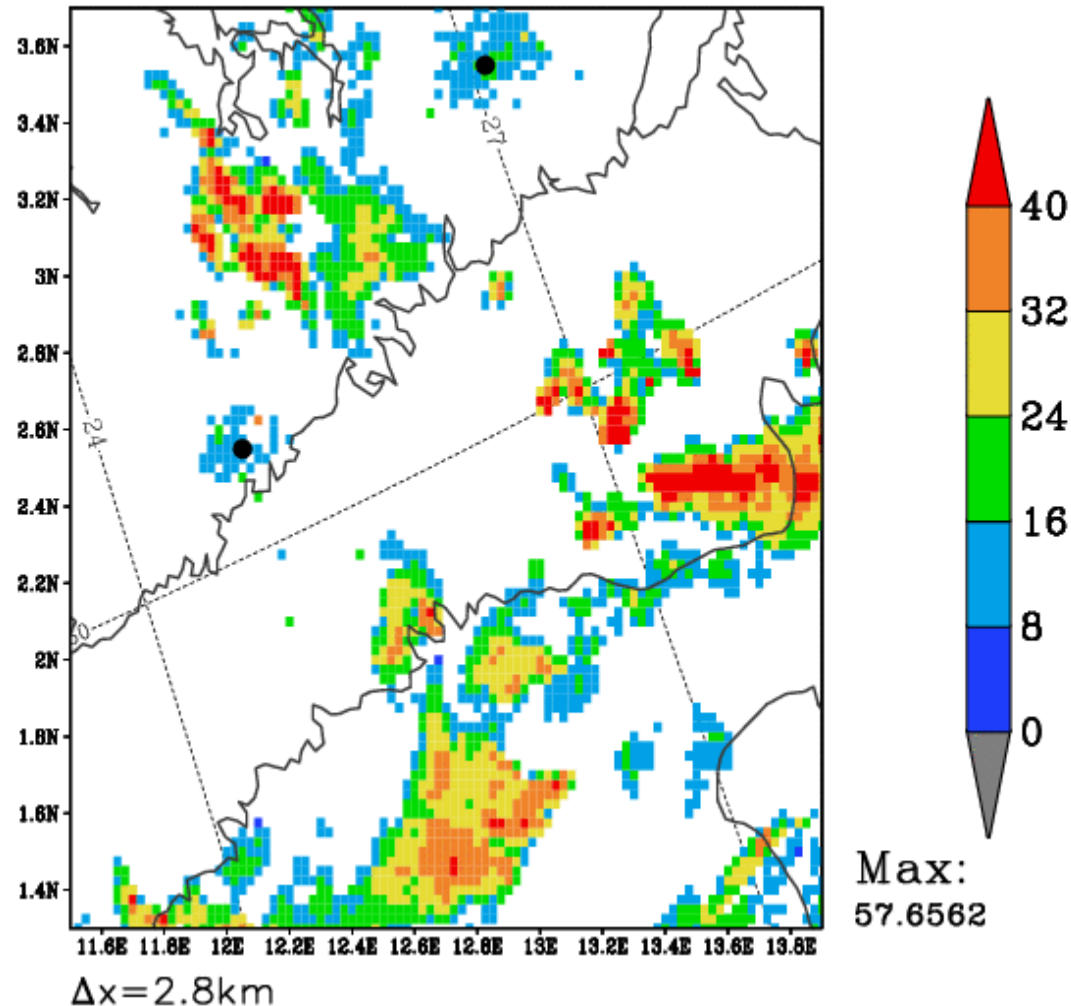
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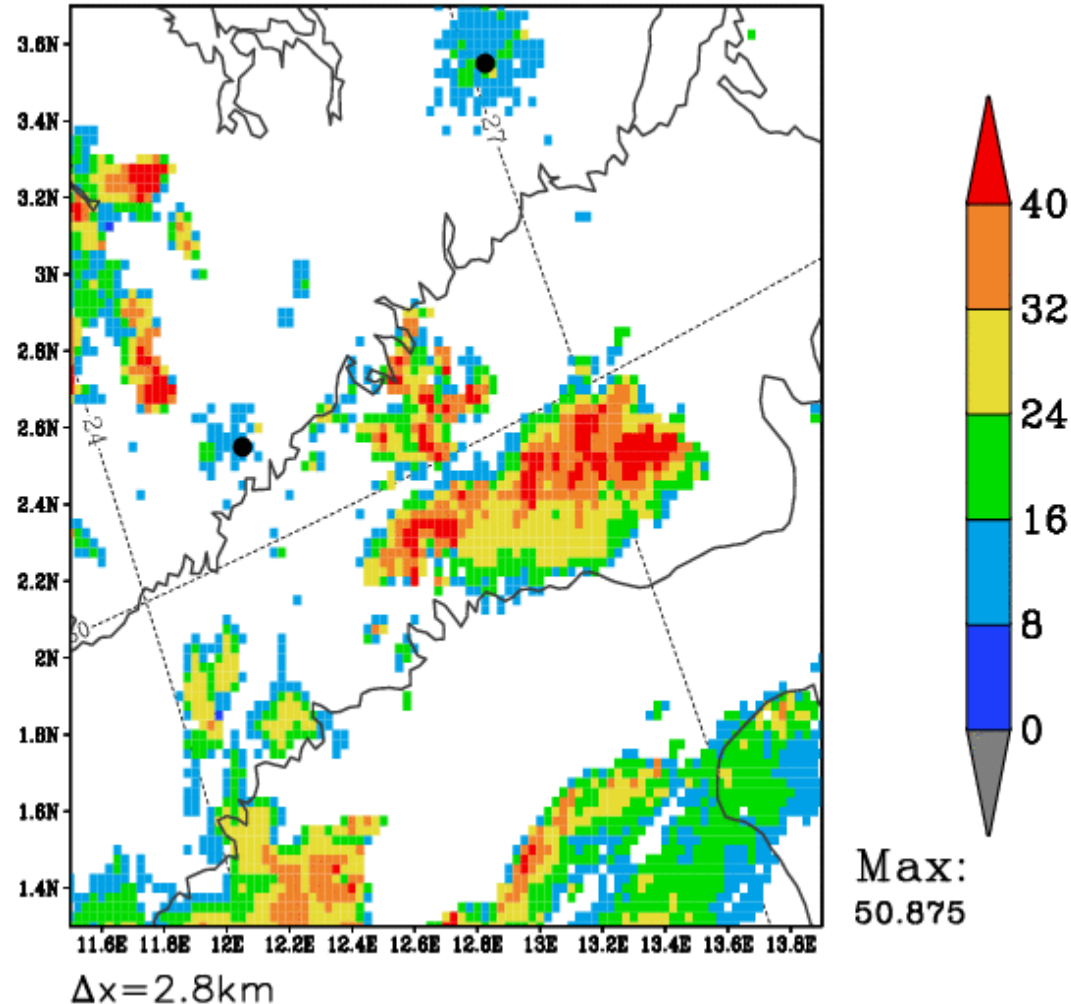
Observed radar reflectivity [dBZ], antenna 0.8°.
VT: 09AUG2005 14 UTC. Rad: KOR, VAN, ANJ, IKA





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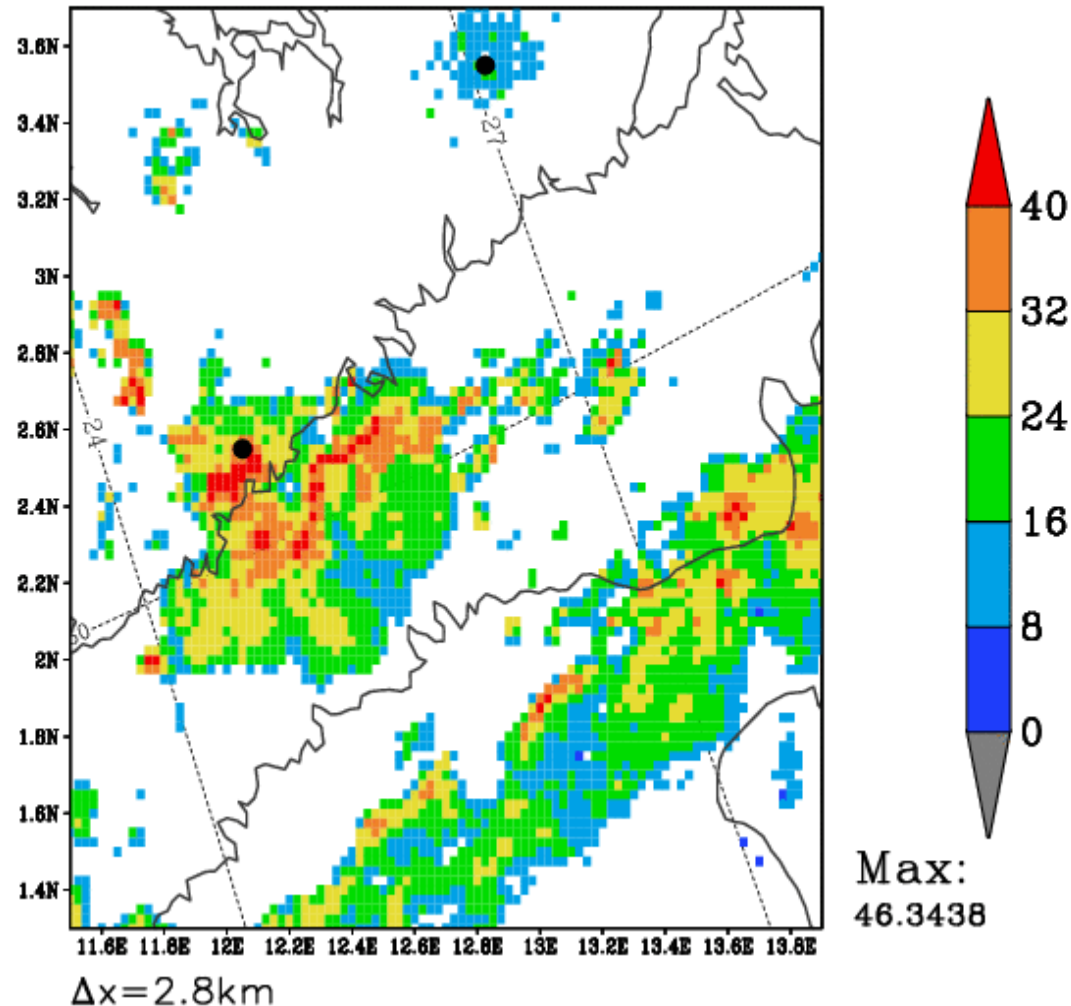
Observed radar reflectivity [dBZ], antenna 0.8°.
VT: 09AUG2005 15 UTC. Rad: KOR, VAN, ANJ, IKA





Case study 9.8.2005 (Helsinki Athletics WC)

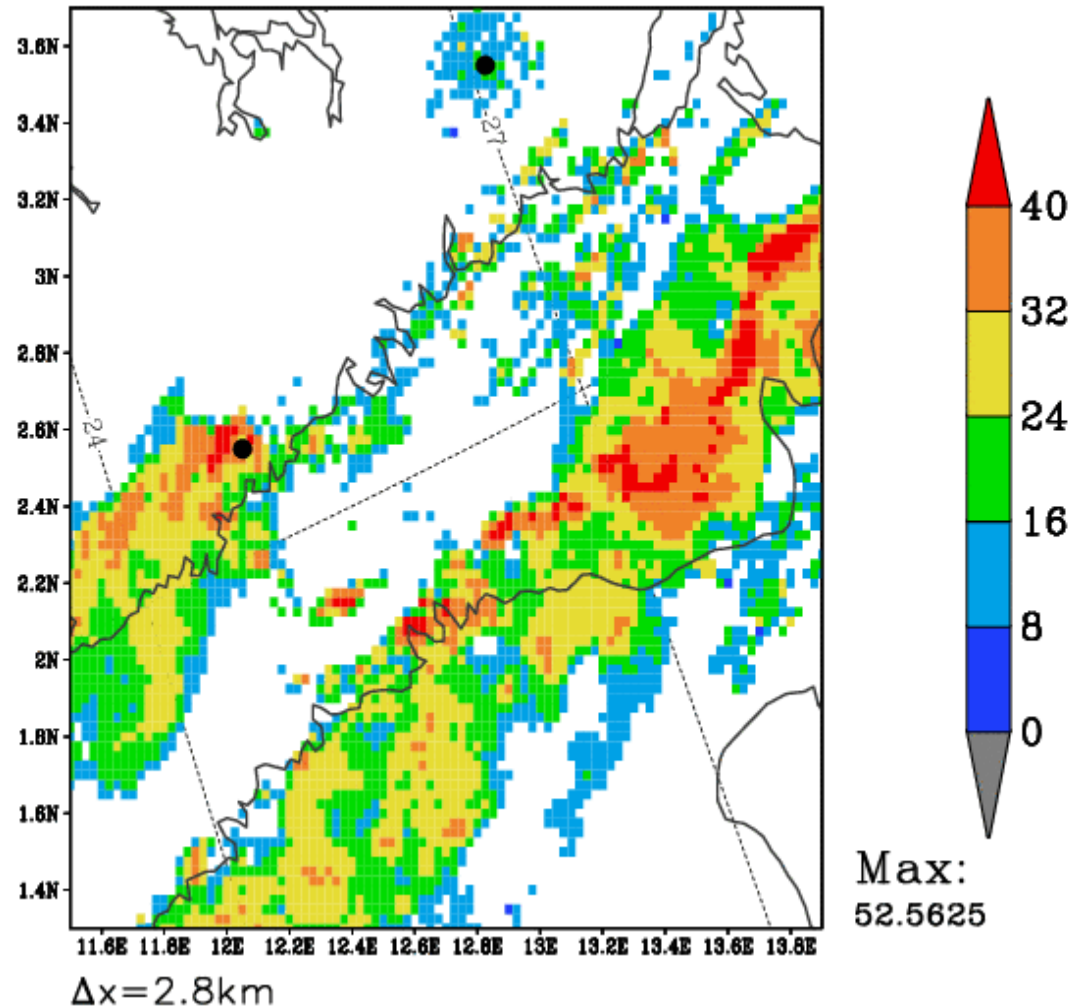
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Case study 9.8.2005 (Helsinki Athletics WC)

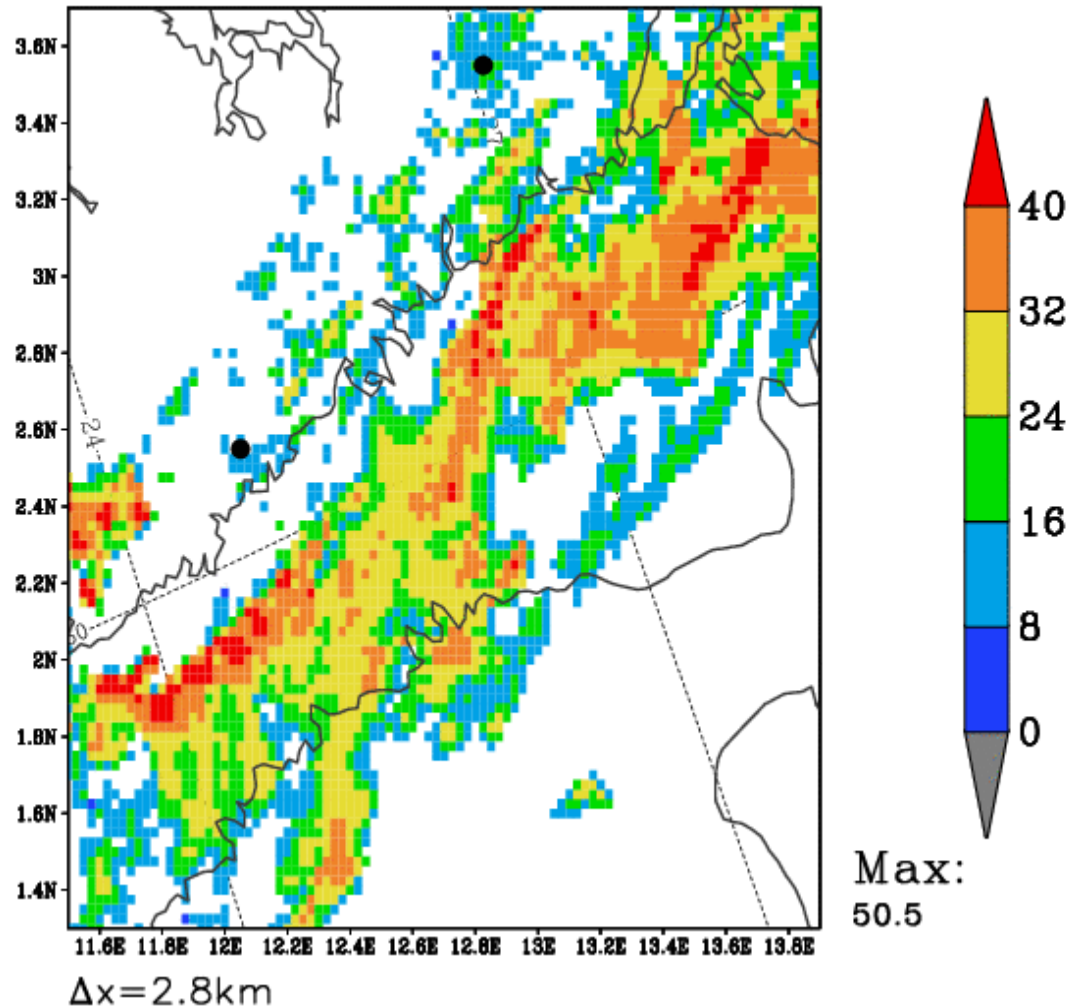
Observed radar reflectivity [dBZ], antenna 0.8°.
VT: 09AUG2005 17 UTC. Rad: KOR, VAN, ANJ, IKA





Case study 9.8.2005 (Helsinki Athletics WC)

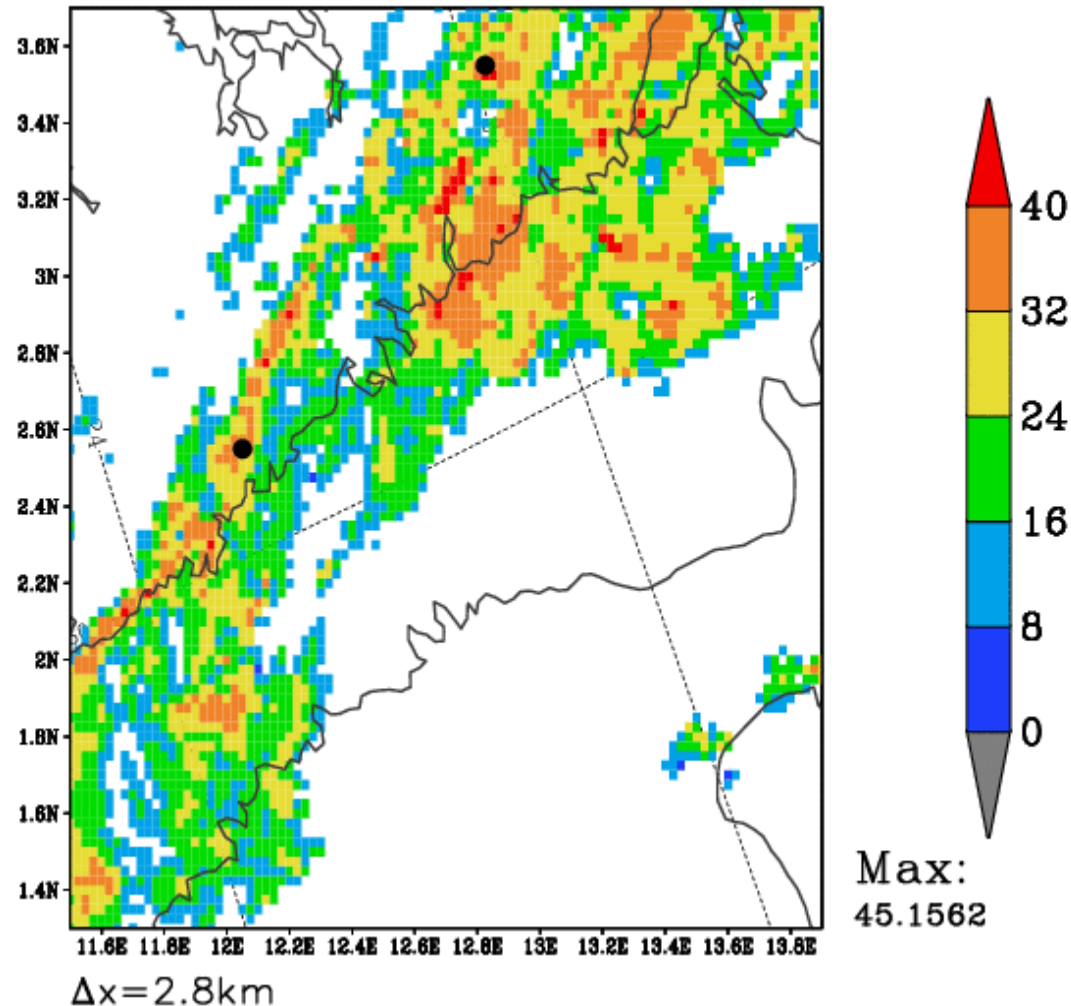
Observed radar reflectivity [dBZ], antenna 0.8°.
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Case study 9.8.2005 (Helsinki Athletics WC)

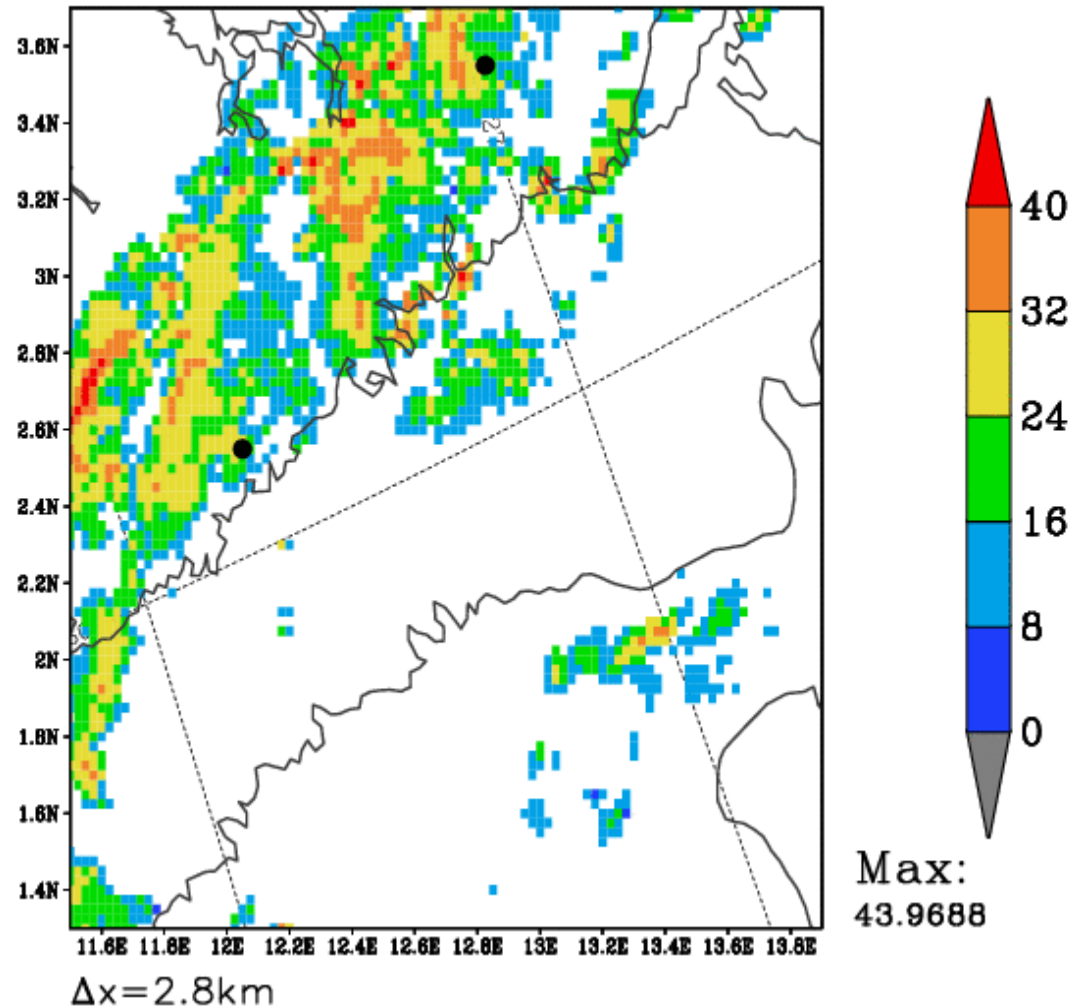
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Case study 9.8.2005 (Helsinki Athletics WC)

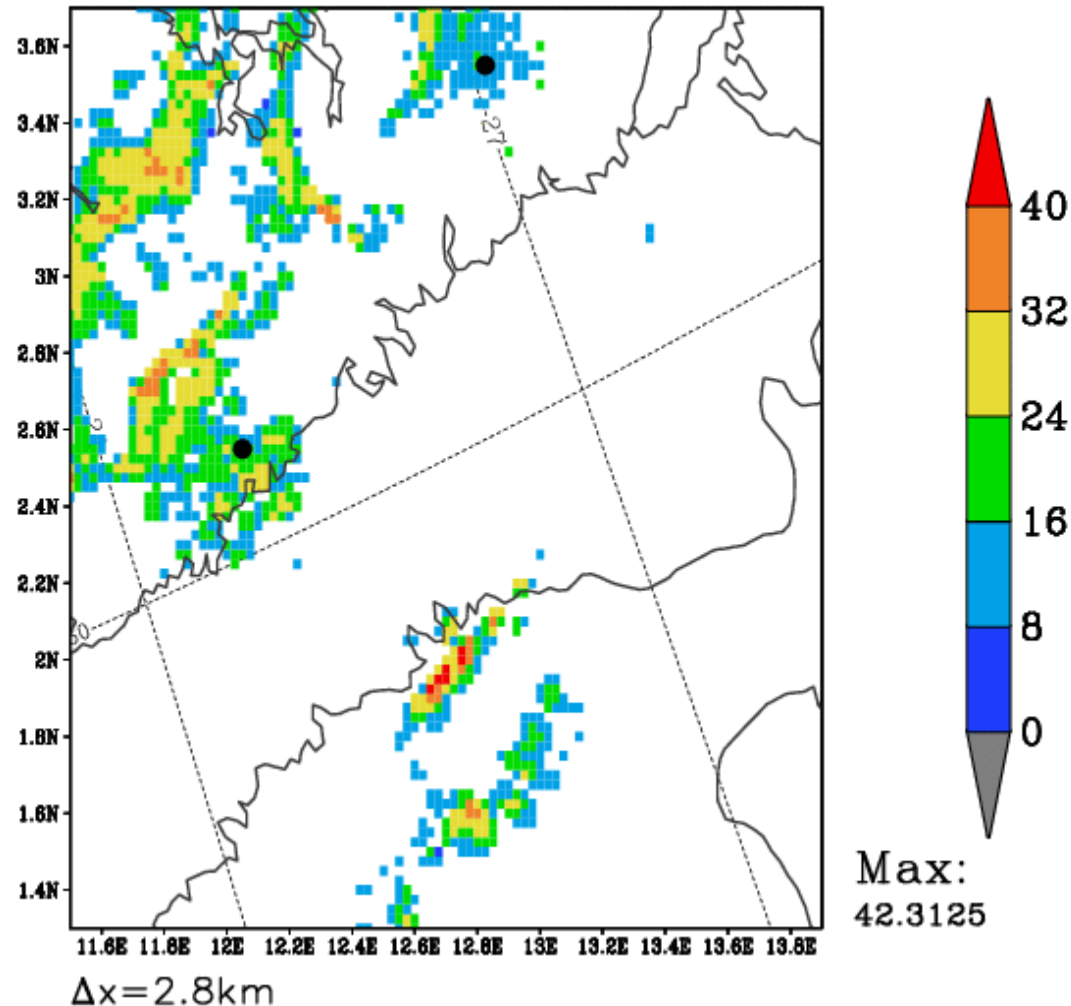
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Case study 9.8.2005 (Helsinki Athletics WC)

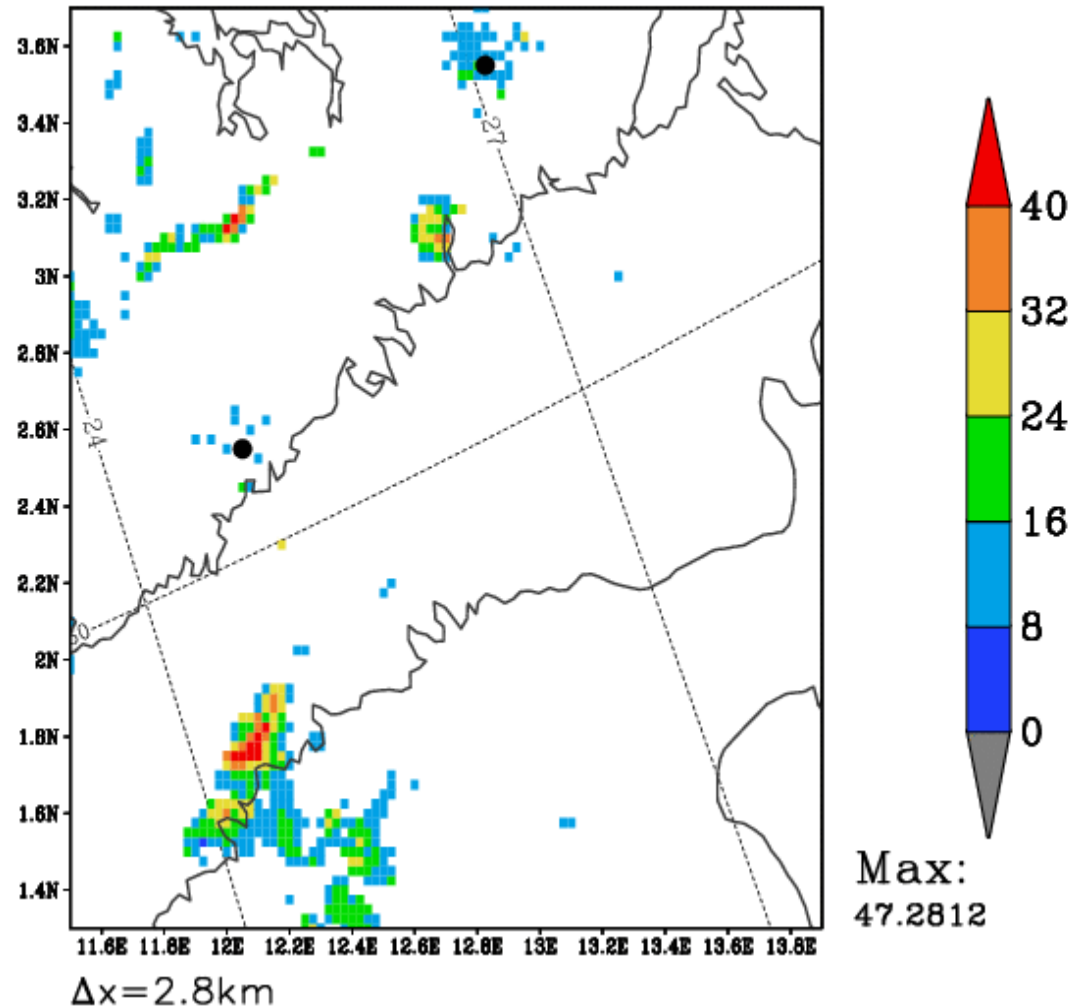
Observed radar reflectivity [dBZ], antenna 0.8°.
VT: 09AUG2005 21 UTC. Rad: KOR, VAN, ANJ, IKA





Case study 9.8.2005 (Helsinki Athletics WC)

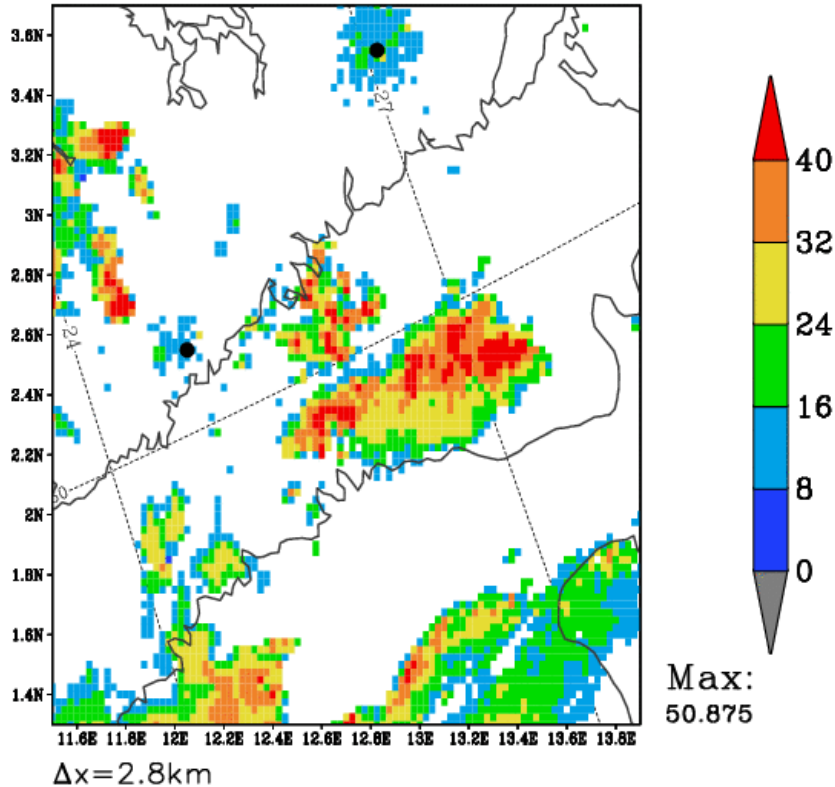
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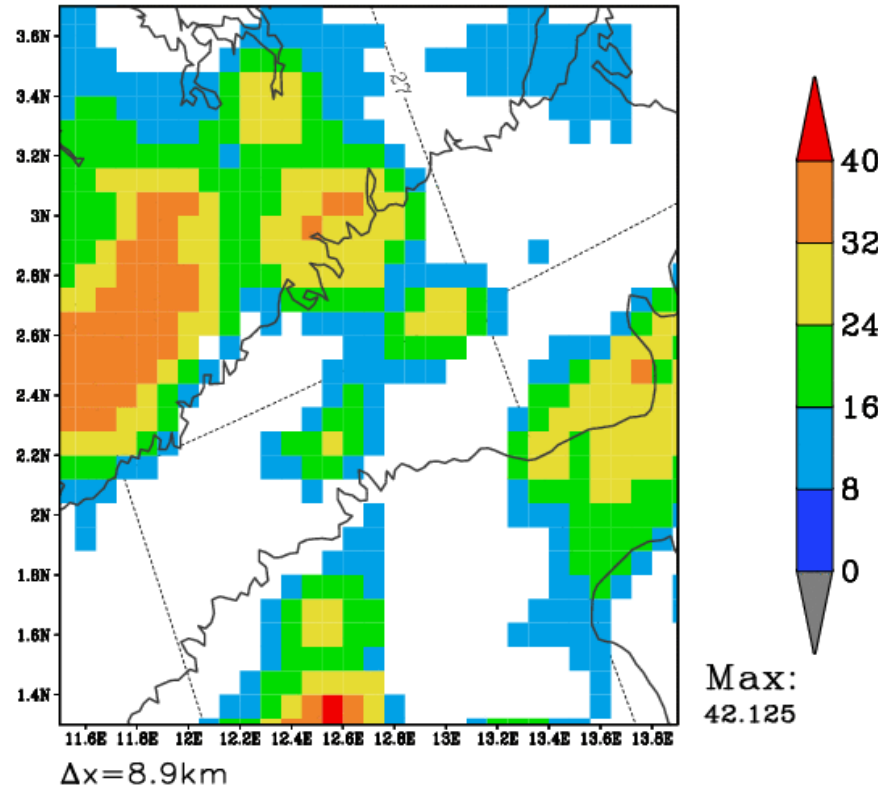


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Observed radar reflectivity [dBZ], antenna 0.8°.
VT: 09AUG2005 15 UTC. Rad: KOR, VAN, ANJ, IKA



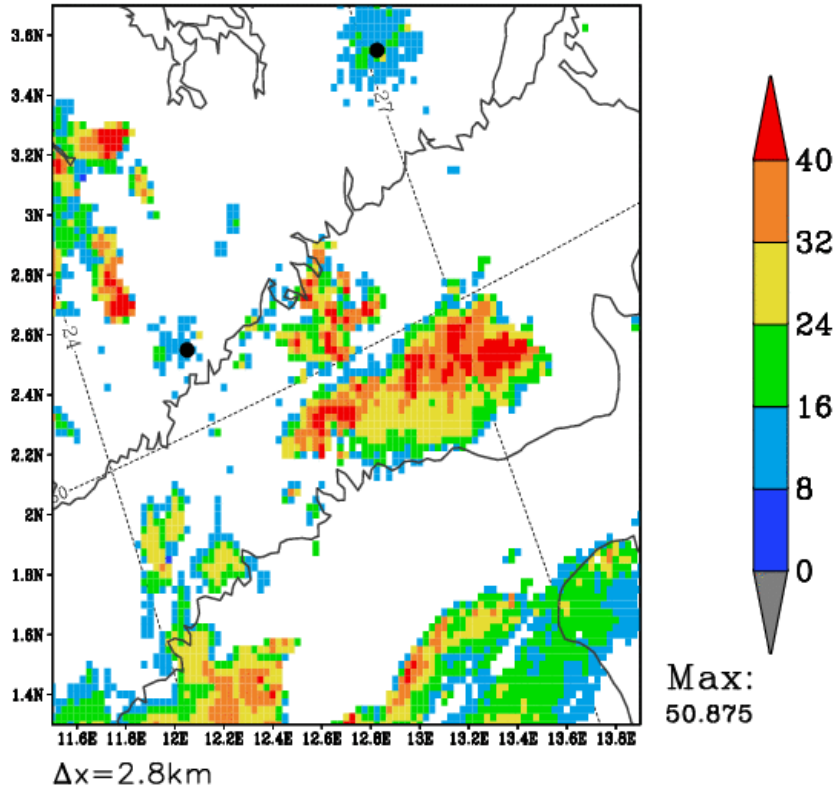
HIRLAM MBEA 09AUG2005 00 UTC. Radar reflectivity [dBZ]
VT: 09AUG2005 15 UTC, +15h Simulation. Antenna 0.8°



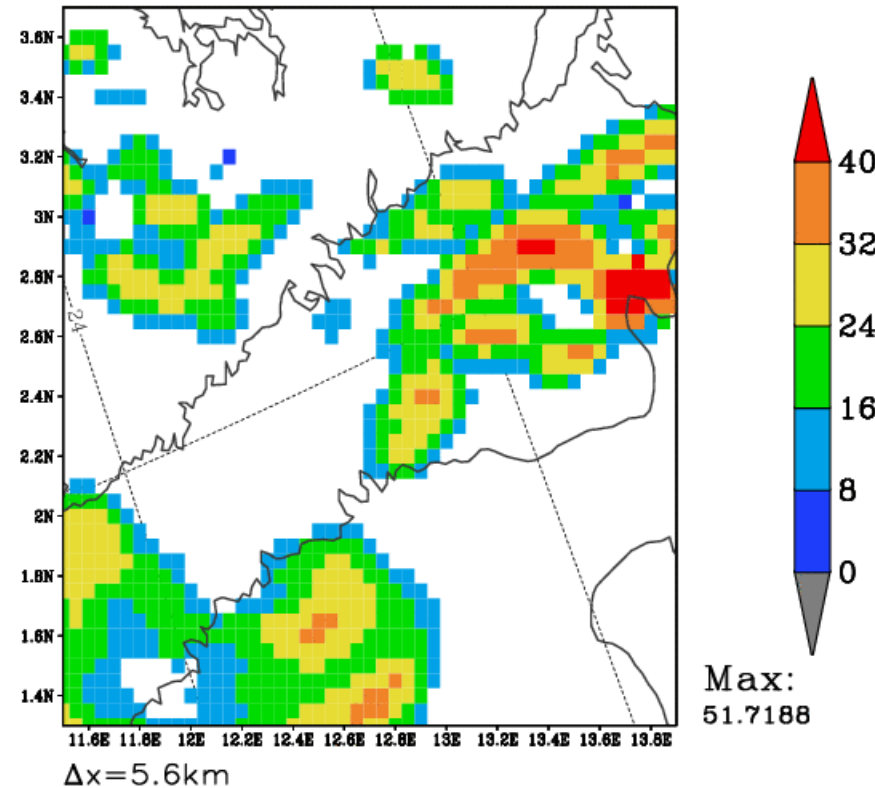


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Observed radar reflectivity [dBZ], antenna 0.8°.
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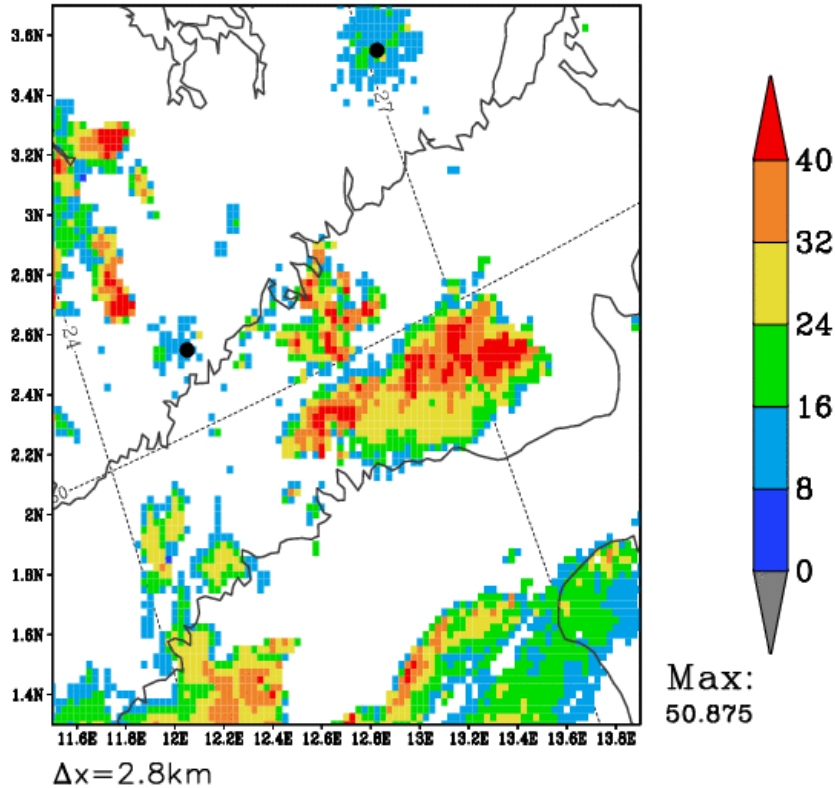
HIRLAM NHH 09AUG2005 00 UTC. Radar reflectivity [dBZ]
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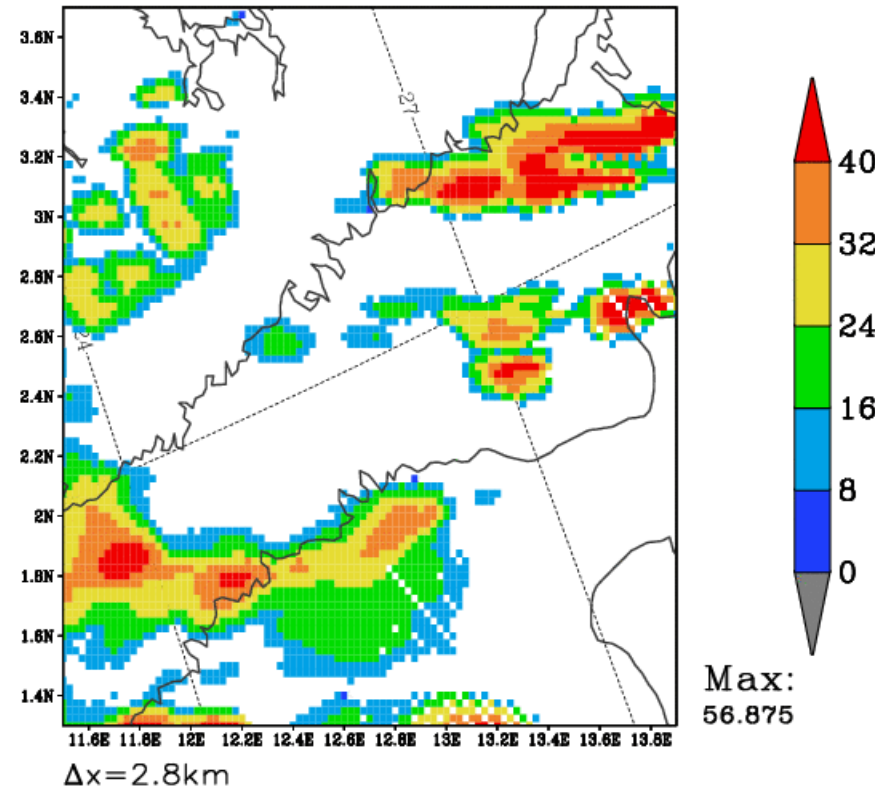


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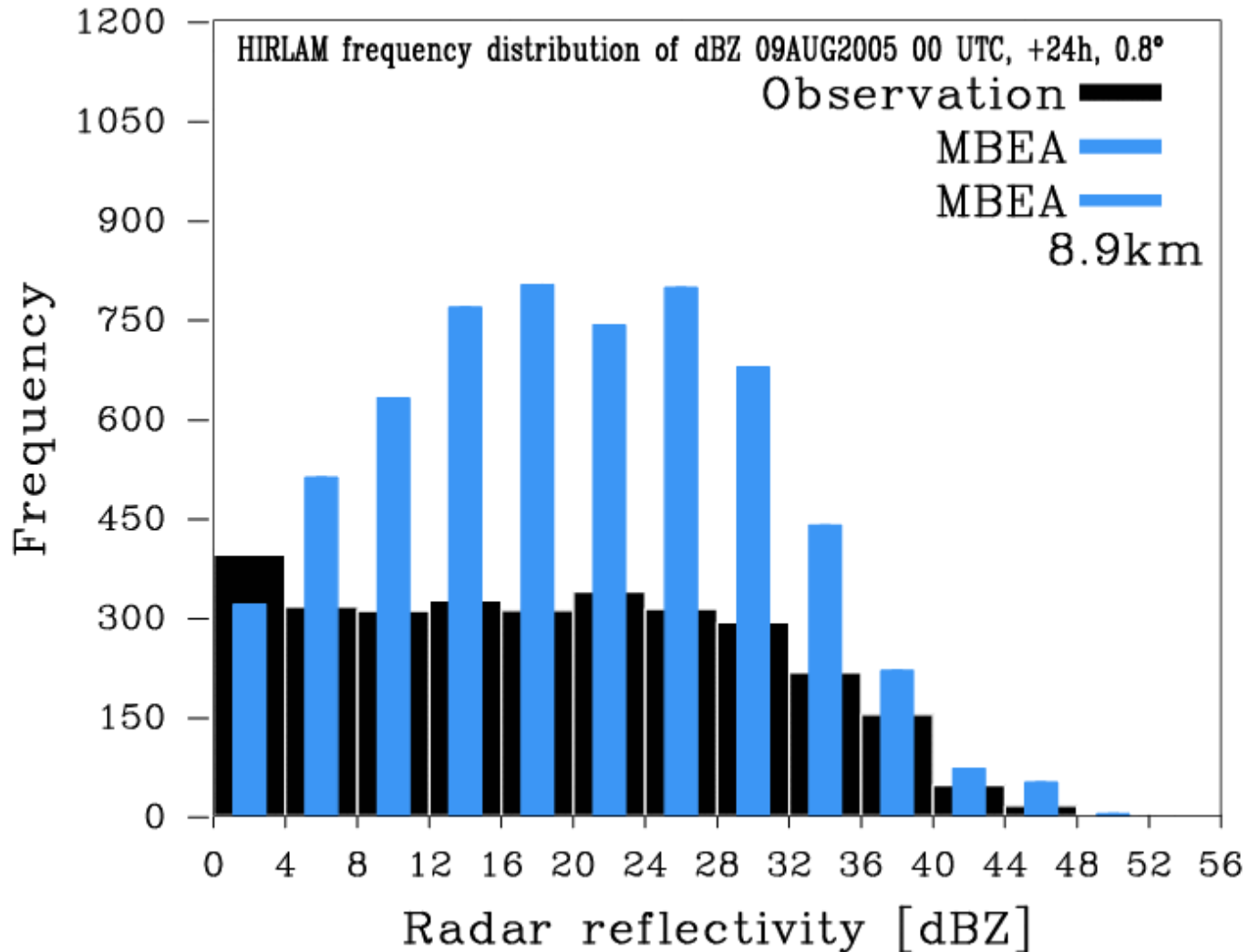


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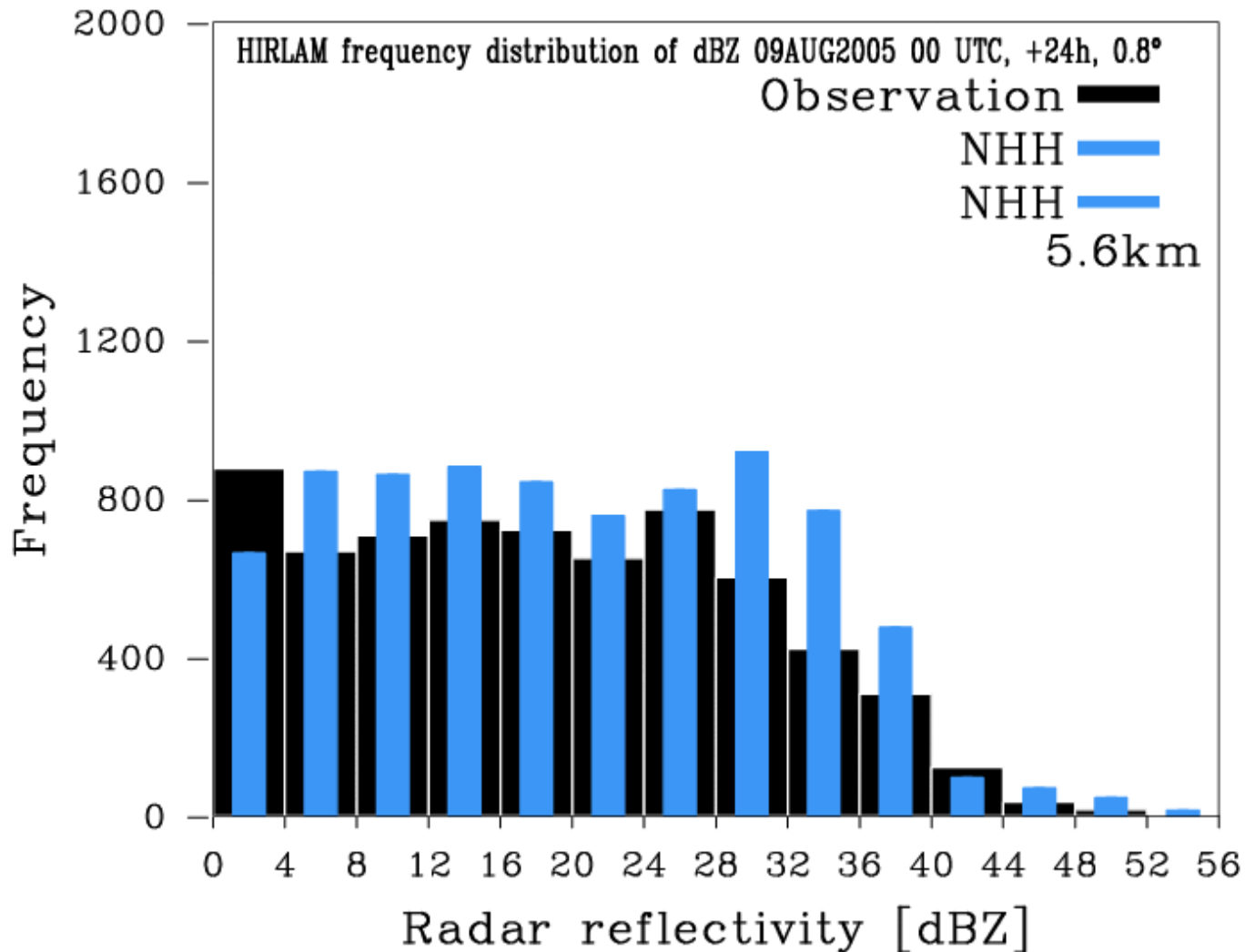


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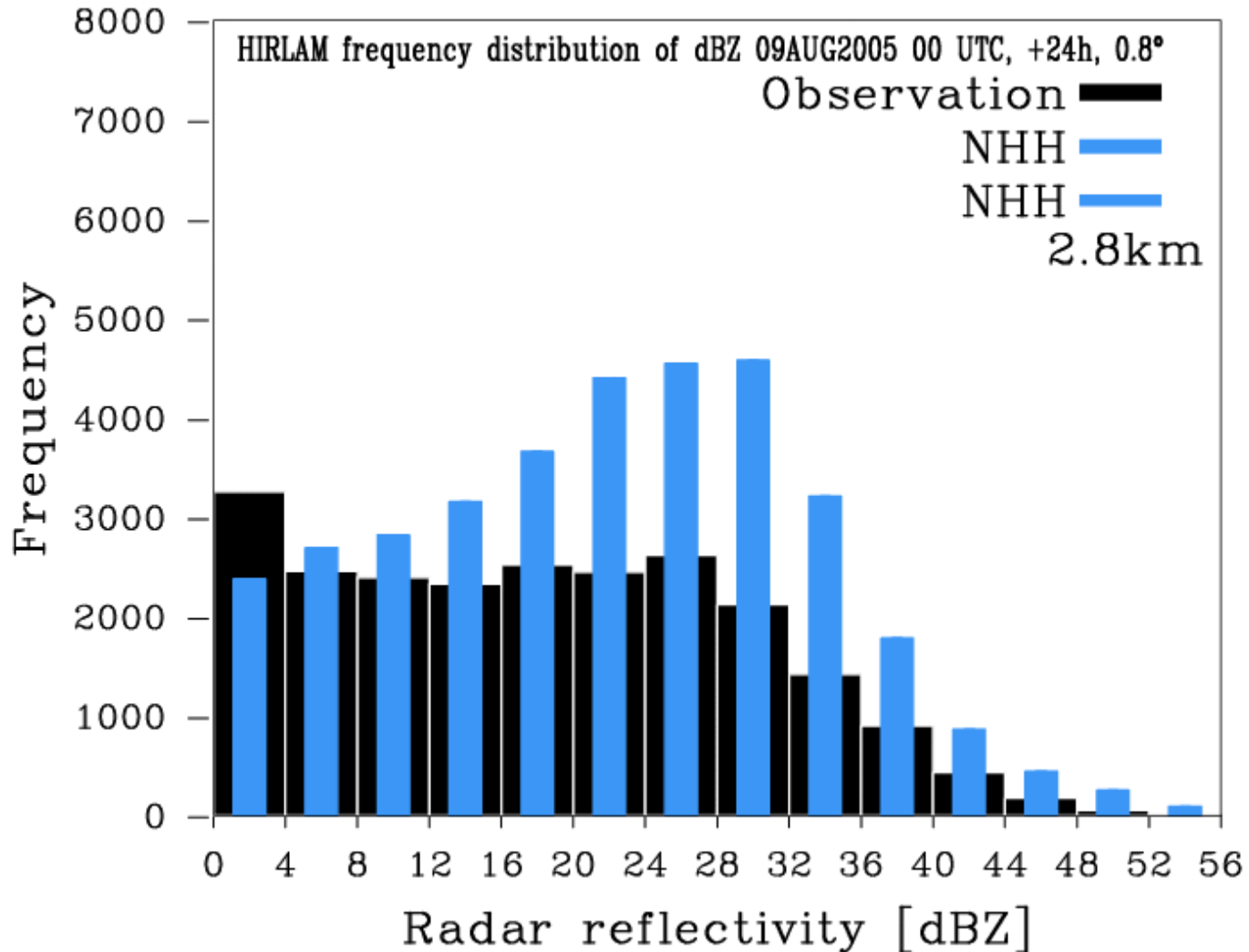


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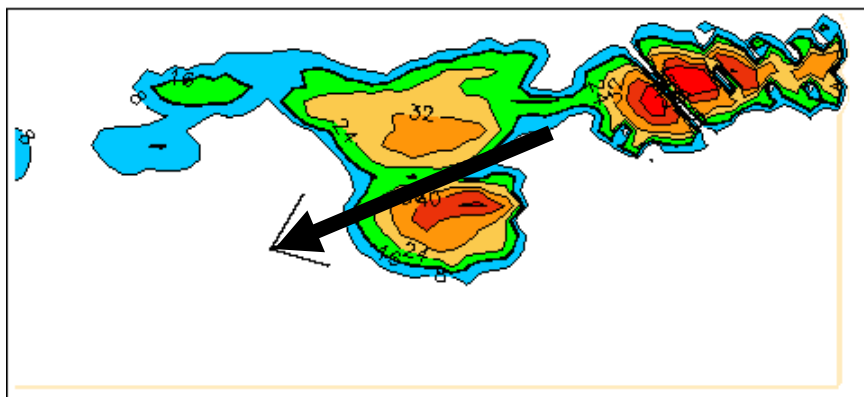
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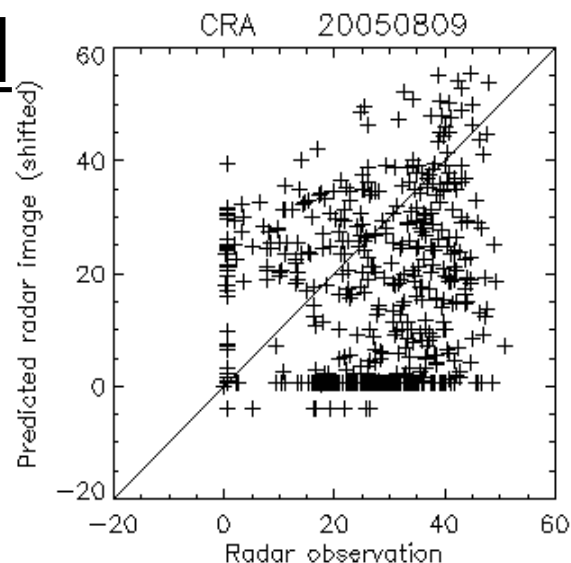
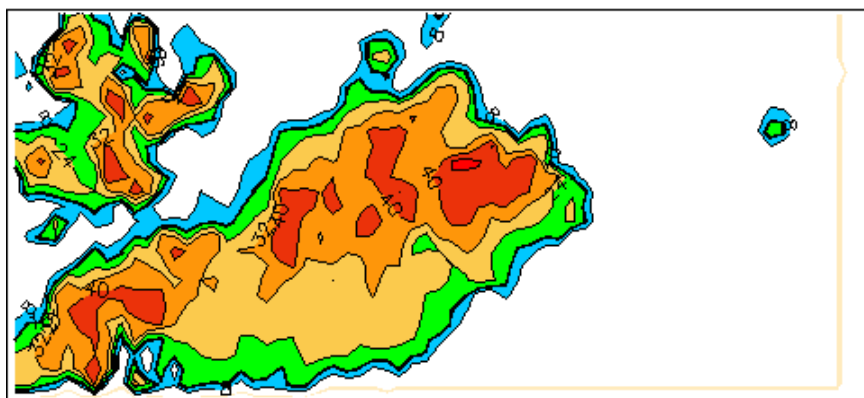


CRA verification method

HIRLAM fcst 20050809



Observation 20050809



HIRLAM 12–24 fcst 20050809 n=723
(2.20°,12.45°) to (2.80°,14.00°)
Verif. grid=0.025° CRA threshold=16.0 dBZ

	Observation	Forecast
# gridpoints ≥ 16 dBZ	520	269
Average (dBZ)	32.07	31.57
Maximum (dBZ)	50.88	55.53
-----	*****	*****

Displacement (E,N) = [0.53°,0.20°]

	Original	Shifted
RMS error (dBZ)	25.63	20.28
Correlation coefficient	-0.232	0.356

Displacement may be wrong – correlation not signif.

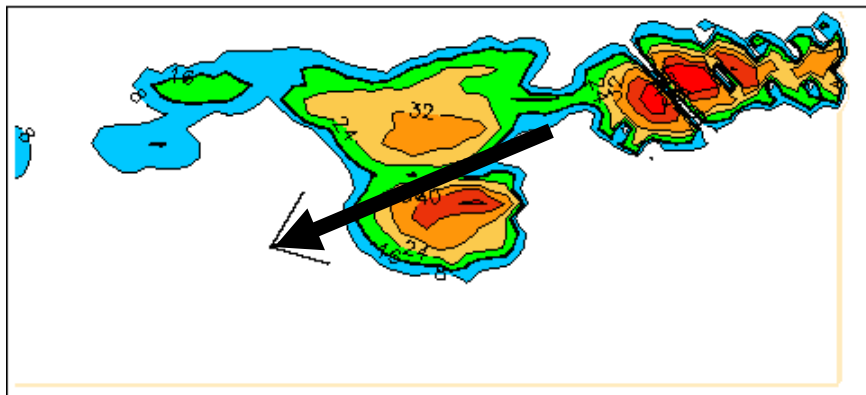
Error Decomposition:

Displacement error	37.4%
Volume error	19.5%
Pattern error	43.1%

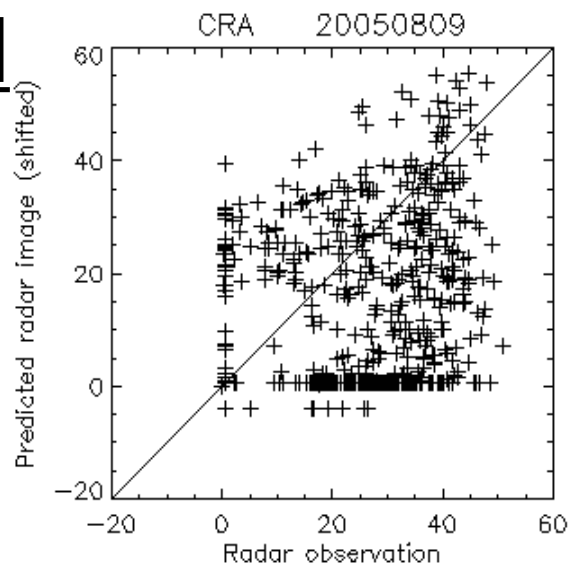
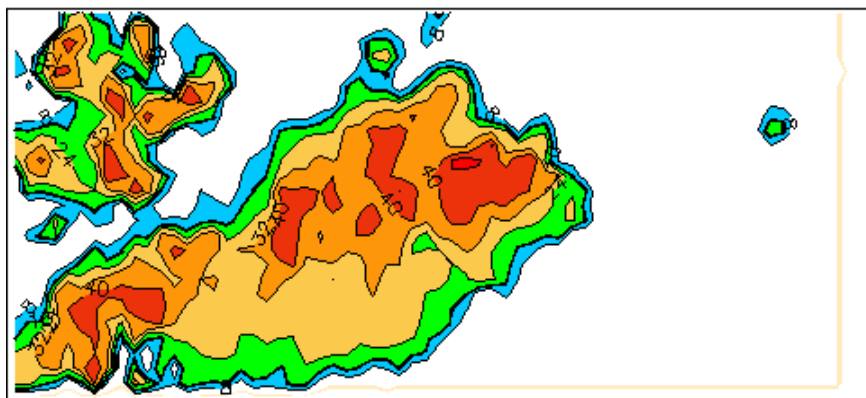


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