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METEOROLOGISKA INSTITUTET
FINNISH METEOROLOGICAL INSTITUTE

Discussion about validation and diagnostics – An introduction

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FMI

Introduction

- **Traditionally we have verified models against**
  - Conventional observations (synop, soundings)
  - Against analysis (field verification)
- **Computes statistical numbers**
  - Rms-error, bias
  - Anomaly, tendency correlation
- **This is still reasonable, when we are in synoptic scale**
- **What to do when going to higher resolution?**

Mesoscale verification and validation working group

- **During the Oslo HIRLAM-ALADIN mini-workshop on 12 and 13 December 2005 it was decided to create a small working group on the verification of special cases for physics development.**
- **A comprehensive set of representative test cases**
- **Covering the average weather types for which it is important for our models to perform well.**
- **Test cases can be used for testing schemes in a more general way and for a larger variety of circumstances than is usually done in validation exercises.**
- **The cases to be selected are not the most extreme ones, but**
  - average day to day weather that is also important to forecast correctly
  - sometimes overlooked in the testing and validation of new or updated schemes.

Workplan

- Website
  - http://www.knmi.nl/~tijm/Verif/Verifworkg.html
  - **the cases and their descriptions**
  - **a description of the verification data and where to find this data**
- set up a verification data database
- collect proposals for weather types that need to be validated/verified
- collect one or two cases per weather type and describe these cases

Workplan (2)

- Collect one or two cases per weather type and describe these cases
  - **general weather with some maps,**
  - **satellite images or any relevant special data**
  - **the specific weather type of interest**
  - **importance for which part of the physics**
- Decide what data to collect in the verification database depending on the case
  - **Synops, radiosondes, precipitation data, radar (if relevant), boudary layer data**
  - **radar data or high resolution precipitation network data**
  - **satellite data**
  - **data from special observation sites like Sodankylä or other masts**
  - **radiation measurements**
  - **ceilometer network measurements**
  - **regular data but with high temporal resolution, cloud radar data, wind profiler data etc. etc.**

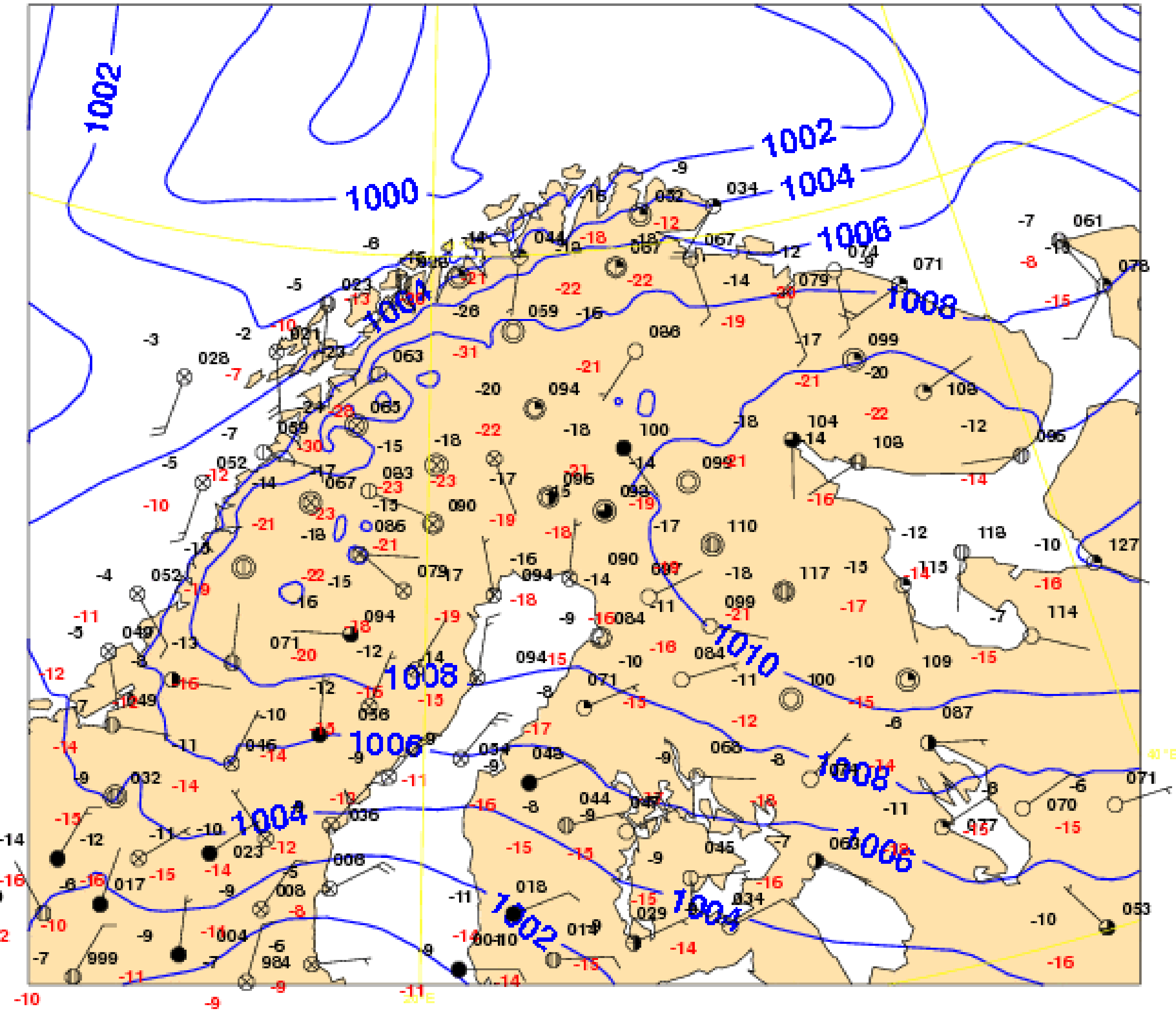
Workplan (3)

- make an inventory of the validation/verification tools available within the different consortia
- collect the tools and make them available for the working group and other persons interested
- develope new tools
- validation/verification of the cases with the different models, make a comparison of the different models to learn from each others strengths and weaknesses.

Possible cases

- Orographic precipitation and precipitation shadows behind mountains
- Shallow, fiar weather cumulus under high pressure conditions
- **Stable boundary layers, very low temperatures over snow in winter (Mariska Derkova, Kalle Eerola)**
- **The decrease of convection over land (Sander Tijm)**
- Daily cycle of precipitation
- **Low clouds and fog development (Sander Tijm, Gwennaelle Hello)**
- Persistent low clouds
- Rapid cyclogenesis
- Anticyclonic situations over Central Europe
- Onset of (severe) summer convection
- Squall line evolution
- Cold fronts with heavy rainfall
- Mesoscale convective systems/complexes
- Sea/lake breezes, possibly initiating deep convection, mountain and/or valley winds
- Wind in front of, over, between and behind mountains
- Coastal fronts
- Organised convection due to land/sea distribution

SYNOP 03.03.2006 12 UTC
HIRLAM Pmsl Analysis



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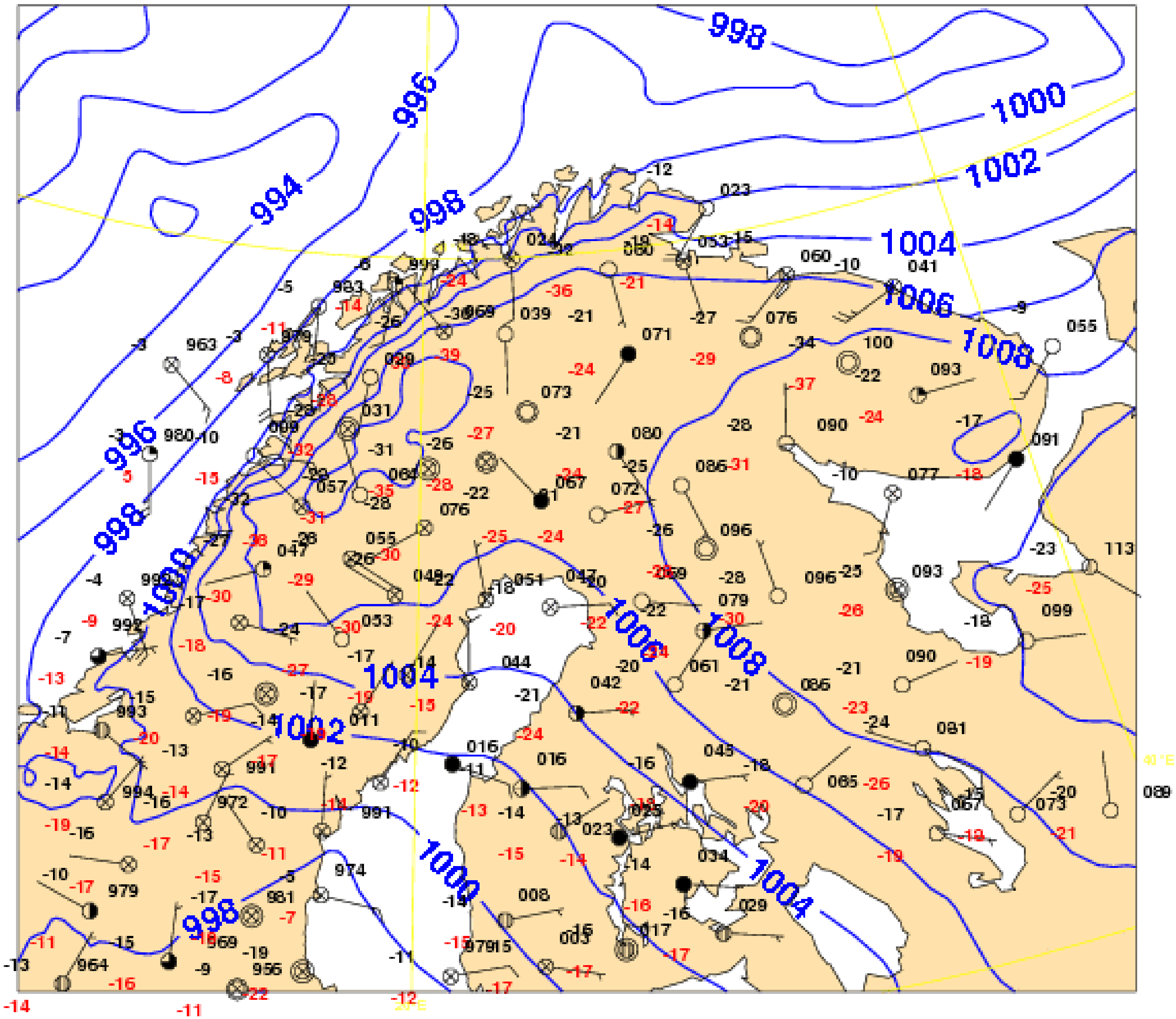
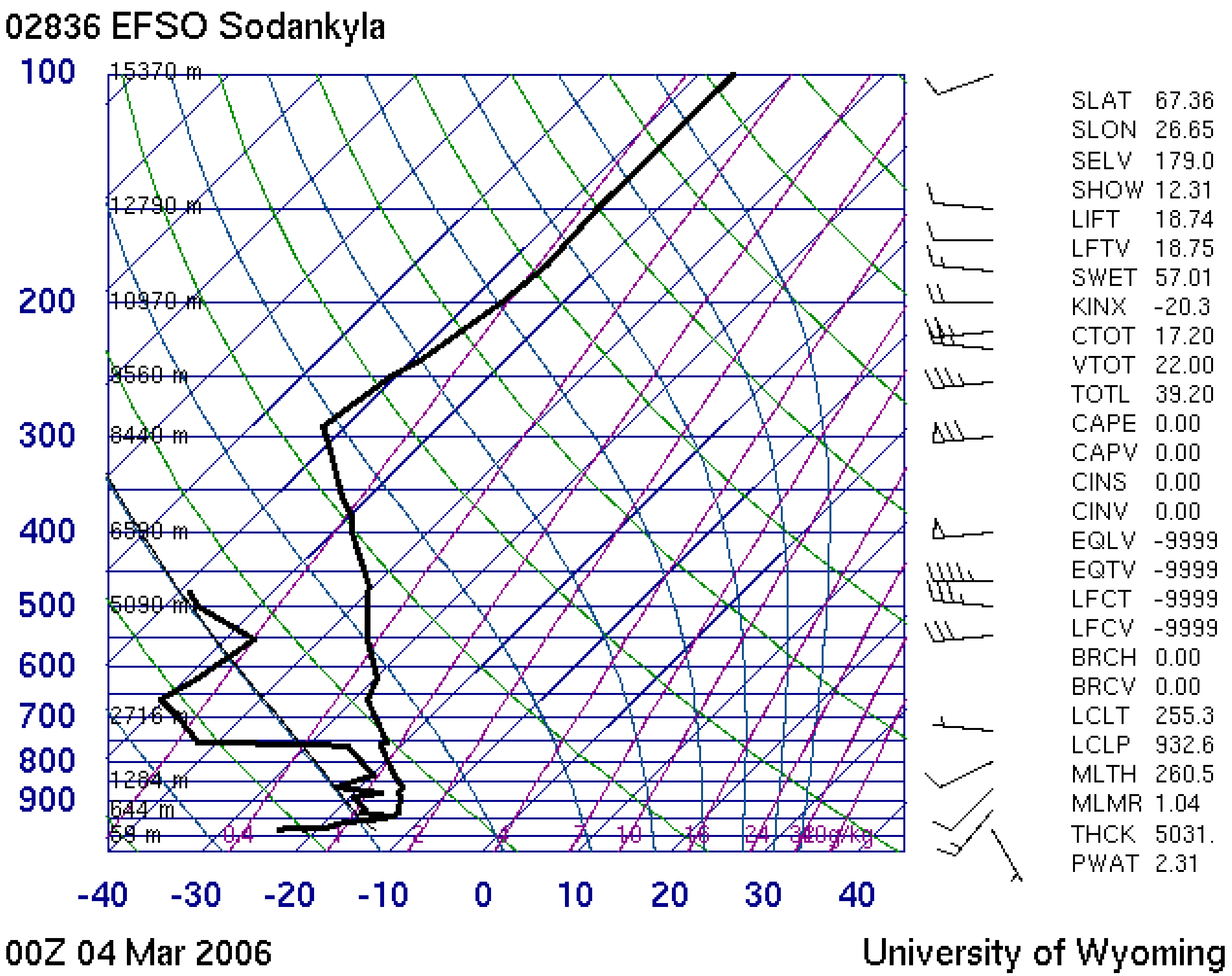
HIRLAM Pmsl Analysis

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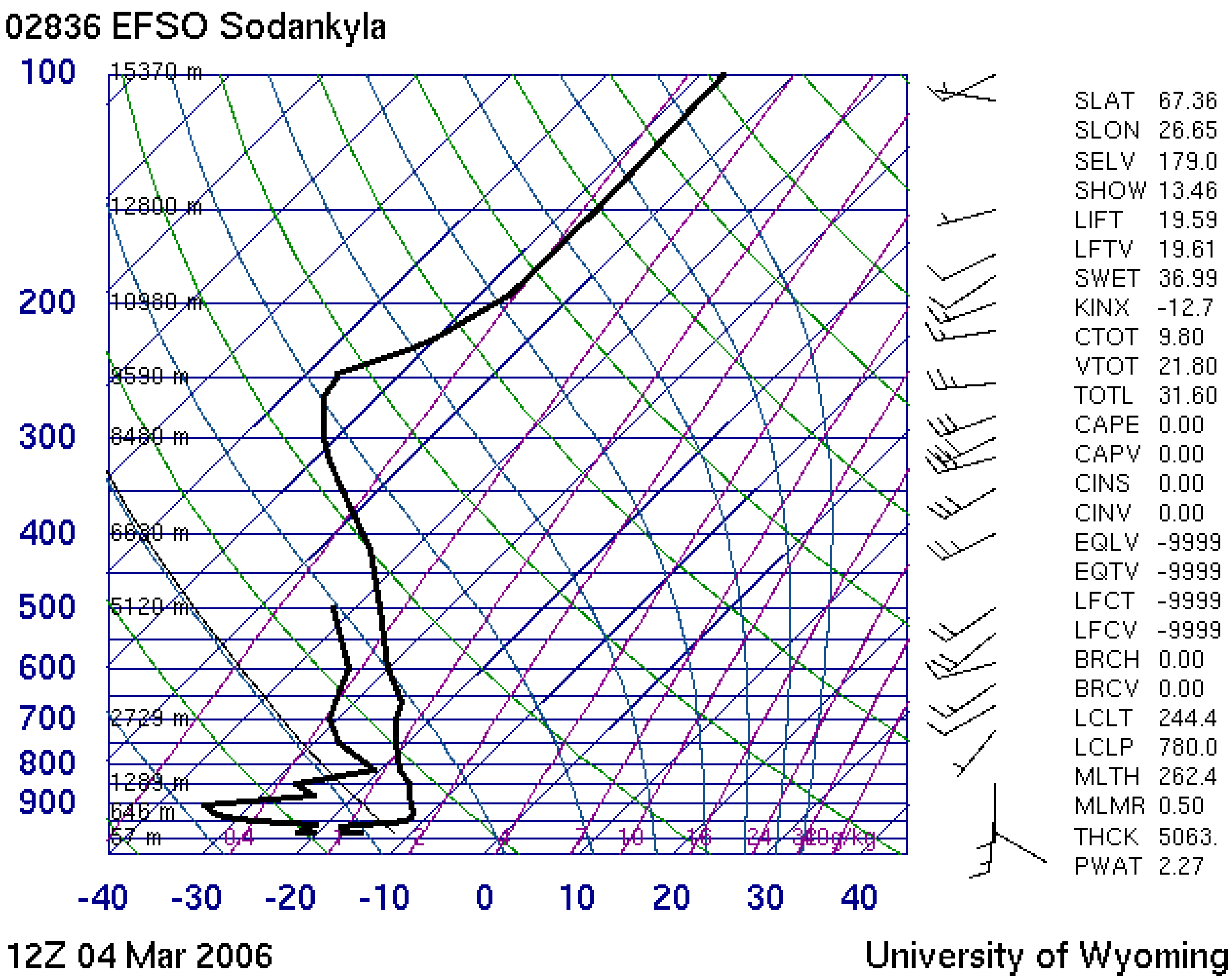

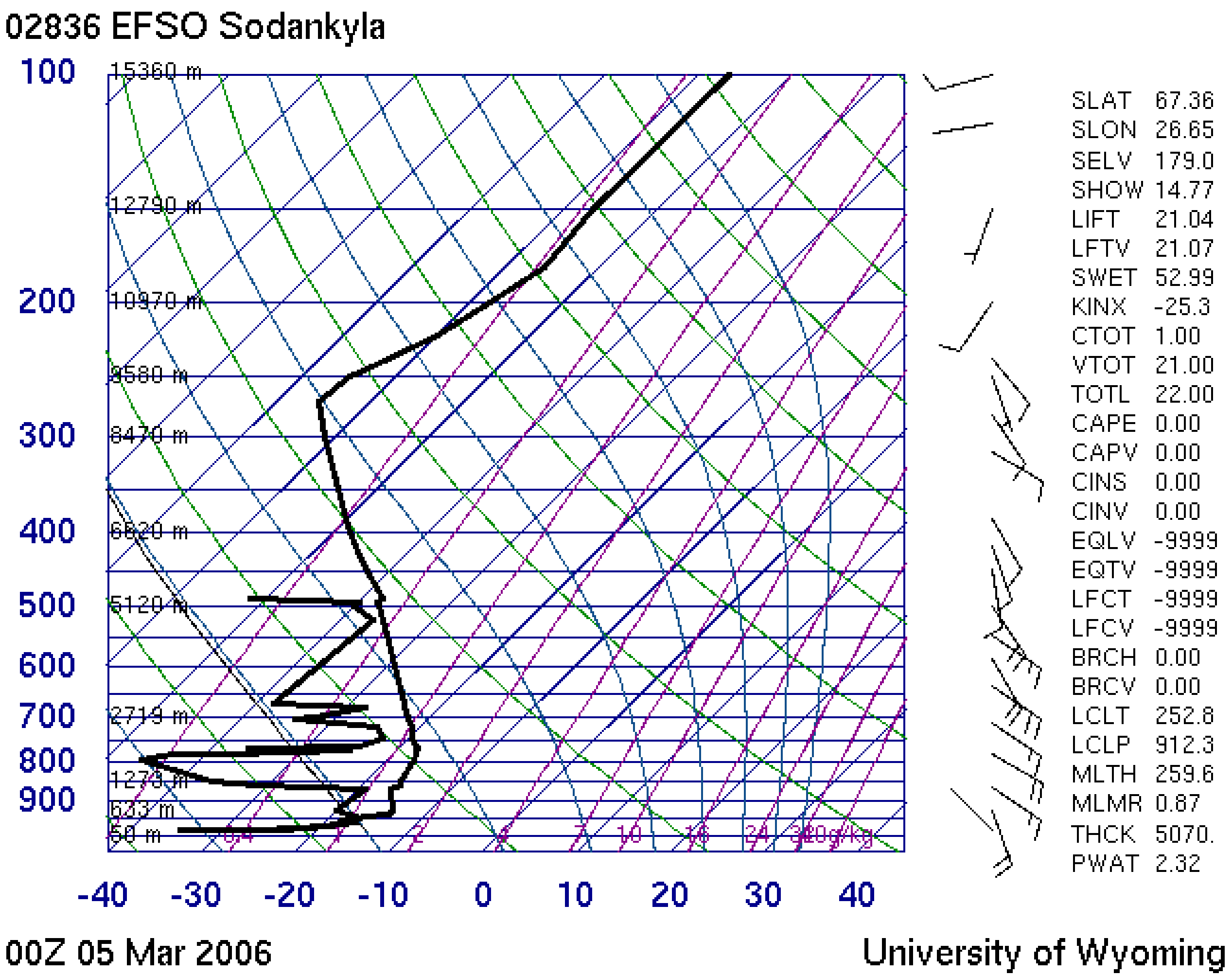
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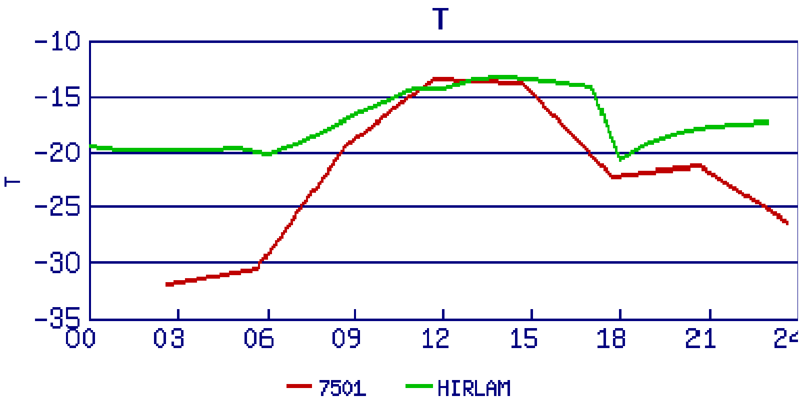
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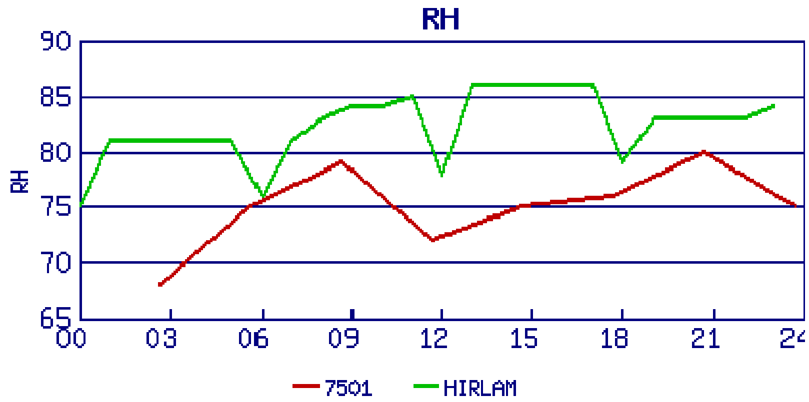
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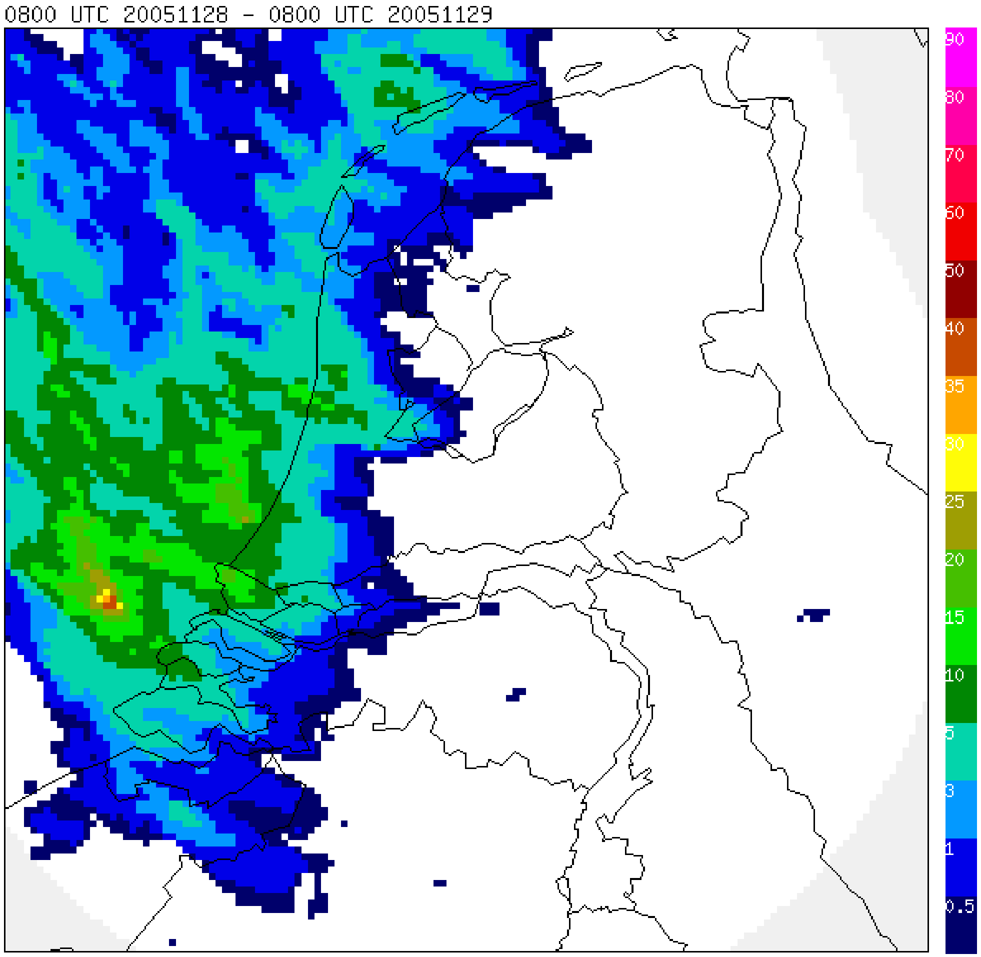
Examples: Convection dying down inland



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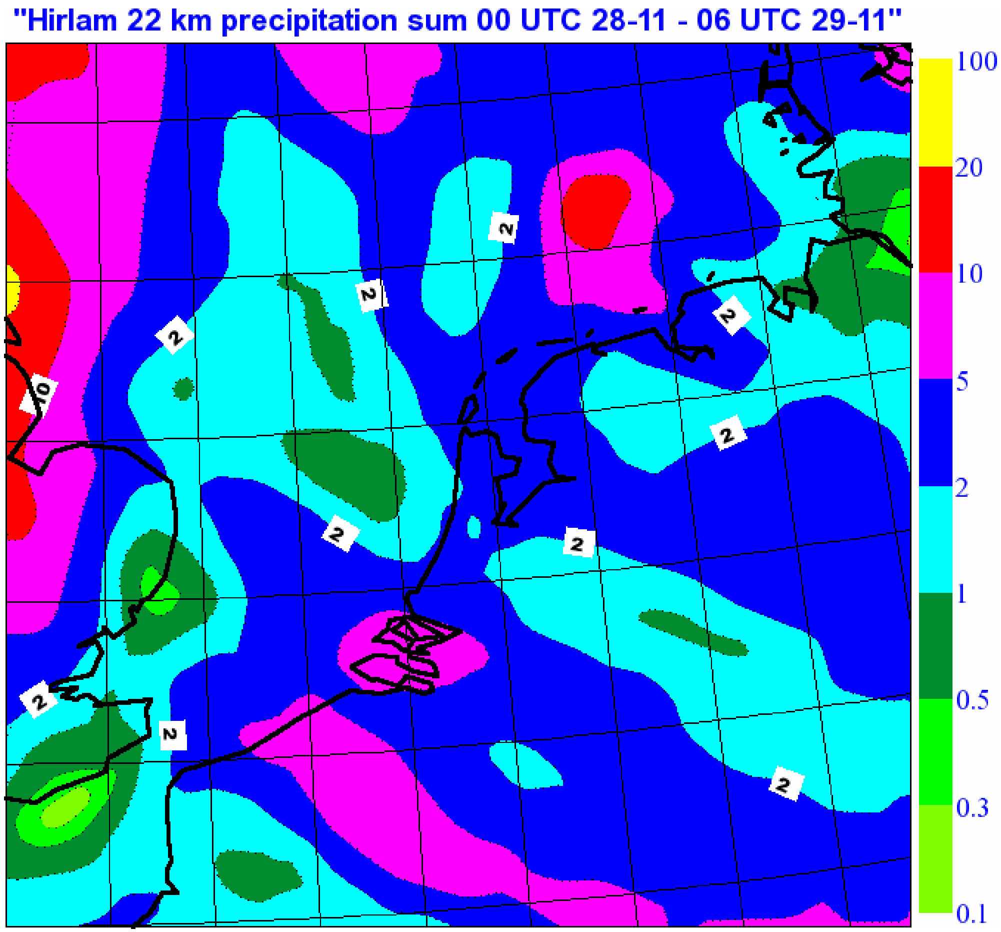

Example of a new tool: radar reflectivity

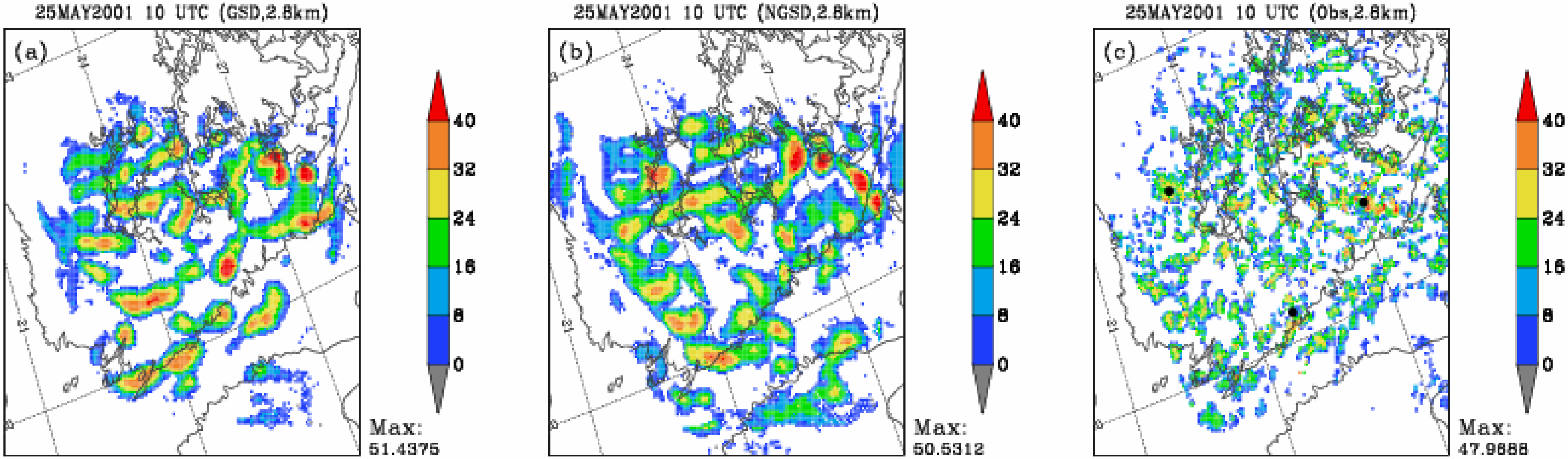

Figure 1: Composite radar reflectivity (dBZ) fields after a 10 hour simulation valid at 10 UTC 25 May 2001. (a) GSD, (b) NGSD and (c) radar observation. The horizontal grid spacing of each field is 2.8 km. The maximum dBZ-value within the area is given next to the figure. The locations of the radars are marked with dots in figure (c).

Niemela and Fortelius (2004)

Questions

- What is a minimum set for the ‘sanity check’ of future models
- How can we show additional value of mesoscale model?
- What data can we use in the validation & verification of current and future models?
- What (new) tools/output do we need to make good/optimal use of mesoscale model?
- What are the important weather types?