Nowcasting system at Danish Meteorological Institute

Claus Petersen
Danish Meteorological Institute

[www.dmi.dk](http://www.dmi.dk), cp@dmi.dk
What is nowcasting?

Nowcasting is forecasting of the weather right now and some hours ahead
Outline

• Users of nowcasting
• Nowcasting model
• Focus on data-Assimilation
• Output to the users
Users of nowcasting

• Road condition model
• Waste water/Water management
• Energy forecasts
• Agriculture
• Weather service/Aviation
• You and me
Nowcasting is needed

In fact improved water management was very much needed 2 July 2011
The challenge
How to integrate frequent/high resolution observations into NWP

Skevns reflectivity 201107021000

ECSS 2013, Helsinki 3-7 June
Nowcasting model

• NWP as engine
• Deterministic approach
• Frequent short range forecasts
• Focus on data-assimilation
Use of observations in the NWP

- Surface analysis (Optimal interpolation type)
  - Soil moisture
  - Surface temperature
    - Sea/lake surface temperature
    - Land surface temperature
  - Snow depth
- Free atmosphere analysis (3D-VAR type)
  - Temperature
  - Humidity
  - Wind
  - Surface pressure
- Rain/Snow intensity and cloud cover (Nudging type)
  - Passive clouds
  - Active clouds
    - Stratiform
    - Convective
Model setup

Analysis every hour at minute 0 using 3D-VAR

Real time start
Cut-off
45 0 15 30

Repeated forecast every 15 minutes but using old analysis

Surface, 3D-VAR Analysis

First guess

Surface, 3D-VAR Analysis

RADAR
SATellite DATA
HIRLAM MODEL

12 hours forecast

And so on...
Assimilation of radar and satellite data

• Active clouds
  – Radar data
    • Adjustment of convergence/divergence
    • Adjustment of specific water vapor content

• Passive clouds (Non precipitating)
  – MSG2 SAF products and observations of cloud cover and cloud base
    • Adjustment of specific water vapor content
    • Adjustment of specific cloud water content
    • Adjustment of cloud temperature
Increase precipitation through dynamic forcing
3D perspective
Increase precipitation through dynamic forcing

2D perspective

Mean wind

Model

Initial state

cloud: Temperature:Tc
Humidity:Fc
Cloud water:Sc

Environment:
Temperature:Te
Humidity:Fe
Cloud water:Se

Radar

Model

After correction

Environment:
Temperature:Te
Humidity:Fe
Cloud water:Se

Cloud:
Temperature:Tc
Humidity:Fc
Cloud water:Sc
Output

NWP: 10 minutes rain and 10 m wind

valid at 2013-05-21 18:10

00.10 hour forecast

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Flooding case 2 July 2011
Thank you for your attention

Claus Petersen

cp@DMI.dk
(Extra slide)Input

Rader
(Extra slide)Input

Cloud mask from MSG-2