Analysis of different forecasts of an extreme precipitation event in Norway

...and a little more

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Exceptionally heavy precipitation led to flooding in Central-Norway 14-15 Aug 2003 (>100 mm 24 h)
The extreme event was rather poorly represented in 4-5 days forecasts but the short-range forecasts were good.

Simulations with the MM5 model from different initial conditions (ECMWF)
Simulated precipitation rate

Bad forecast
+72 h

Good forecast
+48 h
We compare these two situations

72h

48h

AUG12 run

BAD

AUG13 run

GOOD
Geopotential at 300 hPa and relative vorticity

Bad forecast (+24)  Init. cond. for good forecast (+0)
MSLP and T (850 hPa)

A Greenland cyclone
MSLP
Good (isolines)
Good – bad (colour)

The low is 10 hPa deeper in the good forecast
How does the deepening of the cyclone by 10 hPa lead to extreme precipitation?
Temperature at 850 hPa

Good forecast – bad forecast

The good forecast is warmer here
Low-level trajectories ending off the coast of Trøndelag (Central-Norway)
Red: Bad forecast
Blue: Good forecast
Temperature at 850 hPa
Good forecast – bad forecast

The good forecast is warmer here
Isentropes and wind vectors in a cross section from west to east

Bad forecast

Good forecast
Isentropes and wind vectors in a cross section from north to south

Bad forecast  Good forecast
Simulated precipitation rate

Bad forecast
+72 h

Good forecast
+48 h
Conclusions on predictability

- When estimating probability of a similar event, check if the conditions to set up the low level jet are present in the forecasts.

Question: Why was the Greenland cyclone not well predicted?
Climatology and predictability of thunder in Iceland

No. of obs.

Summer maximum

Winter maximum
Poster I

Winter situations: Easy to reproduce and forecast
Summer situations: Difficult to reproduce and forecast

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OBSERVED

SIMULATED
Precipitation in mountain
/ precipitation on lowland
The M-curve

Precipitation in mountain / precipitation on lowland

Low level wind speed
The M-curve

Precipitation in mountain / Precipitation in lowland

Blocked flow

Flow over the mountains

High relative frequency of fronts

Too little time for precipitation to form

Wind speed in lowland (m/s)

(Precip mnt)/(Precip lowland)
Poster III

Precipitation extremes in Iceland (250-300 mm/24h)

Precipitation

Wind at 925 hPa
THORPEX – an international effort

Melvyn A. Shapiro
co-king of THORPEX

Ólafur. R. Grímsson
president of Iceland
A winter thunderstorm: Infrared satellite image from 21 January 1994 at 17:07 UTC.

Thank you