Time-step precipitation across an island in southern Norway – modeled and observed

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Motivation:
Extreme precipitation in relation to climate change

Q: What can we expect from models?
Return period /-amount for Bergen (daily data)

- 14. sept. 2005 (156.5)
- 6. nov. 1917 (123*)
- 17. sept. 1975 (117*)
- 27. okt. 1995 (104.4)

2 months later
Mean precipitation Norway – whole year

Sorteberg & Kvamstø, 2008
Pressure patterns leading up to extreme precipitation

Cluster #

-2 days

Extreme day

Cluster #

-2 days

Extreme day

(Barstad and Sorteberg, 2013, in prep.)
Experimental set-up

Collect precipitation using rain gauges ("tipping" buckets)
For 12 weeks 2006 across an island at the west coast of Norway

Numerical model experiment:
• WRFV3.3, 9-3-1 km, 45-15-5 sec time step
• MYJ, Thompson MP
• spectral nudging (>1000km)

Paper: Barstad and Caroletti (2012; QJRMS)
Domain

9-3-1 km domain

~500 m peaks

Contours every 50 m
Total precip

3 km frontal

3 km convective

Vertically int. water vapor rose
Total precip at 1-km grid

Max: ~830mm

Blue = precipitation contours
(Acc: 12 weeks)

<table>
<thead>
<tr>
<th>STOPEX</th>
<th>Tot. acc (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1 - Bremnes</td>
<td>483/543</td>
</tr>
<tr>
<td>P2 - Børtveit</td>
<td>675/938</td>
</tr>
<tr>
<td>P8 - Hovaasen</td>
<td>554/717</td>
</tr>
<tr>
<td>P9 - Kattnakkjen</td>
<td>768/1239</td>
</tr>
<tr>
<td>P10 - Korsvik</td>
<td>487/614</td>
</tr>
<tr>
<td>P18 - Y-Sollivatnet</td>
<td>693/838</td>
</tr>
</tbody>
</table>

mod/obs
Precip at high percentiles

(10min accumulation)
Time-step precip

OBS

(0.2 mm per tip)
Time-step precip

OBS

1 km

3 km

(0.2 mm per tip)
Time-step prec – No convective scheme at 3km grid

OBS

1 km

3 km

(0.2 mm per tip)
Radiosonde info
Extreme precip cases (q99)
Shallow convection

Radar picture of precipitation in a westerly flow
Conclusions

• Numerical models are able to produce intensities similar to observed provided a grid spacing of about 3km.

• The high intensities depend a lot on usage of convection scheme.

• Convective potential over a relative warm ocean plays a big role.