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with a great deal of thanks to Daniel Martín (AEMET) for the CAMS implementation and Ulf Andrae (SMHI) for technical support.

More results of impact of aerosol dataset on precipitation along the Norwegian coast

Background

Precipitation bias from coast (too dry) to mountains (too wet).

Contributing factors:
- Artificial sea-land border in CCNs. Default: 100/cm$^3$ (sea), 300/cm$^3$ (land).
- Undercatch of wind-blown snow in high-mountain area.
- Spatio-temporal distribution of CCNs not represented.

Experiments

Sensitivity experiments with different CCN concentrations:
- CTR: 100/cm$^3$ (sea), 300/cm$^3$ (land)
- Exp2: 100/cm$^3$ (sea), 100/cm$^3$ (land)
- Exp3: 300/cm$^3$ (sea), 300/cm$^3$ (land)
- CAMS: Using interactive aerosols from CAMS near real-time (NRT) forecasts. HARMONIE implementation developed by Daniel Martín (AEMET).

Table 1: One-month (Jan 2020, cy40h11) changes between CAMS and CTR for error measures for a few key variables. Green background means CAMS results are better than CTR, and pink means worse.

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<table>
<thead>
<tr>
<th>Variable</th>
<th>All stations</th>
<th>Mountain stations (&gt;700 m)</th>
<th>Coastal stations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Abs mean</td>
<td>SD of error</td>
<td>Abs mean</td>
</tr>
<tr>
<td>Precipitation [mm/day]</td>
<td>0.27 (-0.7%)</td>
<td>0.17 (-2.2%)</td>
<td>0.00050 (+0.023%)</td>
</tr>
<tr>
<td>T2m [K]</td>
<td>0.048 (+3.2%)</td>
<td>0.037 (1.2%)</td>
<td>0.002</td>
</tr>
<tr>
<td>RH2m [0-1]</td>
<td>0.00038 (+1.2%)</td>
<td>0.0006 (+2.0%)</td>
<td></td>
</tr>
<tr>
<td>Wind 10m [m/s]</td>
<td>-0.27 (25%)</td>
<td>-0.27 (4.7%)</td>
<td>0.000085 (11.1%)</td>
</tr>
<tr>
<td>SLP [m]</td>
<td>-5.5 (-38%)</td>
<td>-3.3 (-24%)</td>
<td>±0.051</td>
</tr>
</tbody>
</table>
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Fig. 1: Precipitation bias from 13-year HCLIM38 simulation relative to seNorge gridded precipitation dataset.

Fig. 2 (left): More realistic CCN concentrations ([cm$^3$]) from CAMS from 2020-01-01 18h. Evolving in both space and time.

Fig. 3: A high-precipitation case (2017-12-23). Exp2 and CAMS show better spatial agreement with observations (squares).

Fig. 4 (left): First cy43 CAMS results (one month, May 2020) over Western Norway. Selecting observations with >10 mm precipitation and separating into coastal (C) and mountain (M) stations. Both MEPS (deterministic) and CAMS show overall dry bias. Improved results with CAMS.

Fig. 5: Standard deviation of error [mm].

Ongoing and future work

- Improved precipitation errors on the coast.
- Small improvement in precipitation correlation.
- Overall improvements also in wind and SLP.
- Worse results for temperature.

Experiments — continued

- Evaluation of cy43 METCOOP forecasts (with land/sea CCN identical).
- More experiments with cy43 CAMS-NRT aerosols.
- More verification (especially as function of forecast length).