Recent advances in climate modelling for impacts studies

Coppola Erika
International Center for Theoretical Physics
Trieste, Italy

coppolae@ictp.it
What would we like for our impact models?
Shopping list:

- The highest resolution
- The perfect input
- The longest time series
Context: **competing demands to improve climate prediction - resolution, complexity and ensemble size**

The longest time series

1/12°

Computing Resources

The perfect input
Coordinated European on-going project

Med-CORDEX → FPS-CORDEX on CP → EURO-CORDEX

#H2020

European Climate Prediction System
Computational Resources

- 54 member ensemble
- 150 years length
- 2 scenarios RCP2.6 and RCP8.5
- All simulation available on ESGF archive
<table>
<thead>
<tr>
<th>INSTITUTE</th>
<th>CP-RCM</th>
<th>Resolution (km)</th>
<th>Driving RCM</th>
<th>Resolution (km)</th>
<th>GCM</th>
</tr>
</thead>
<tbody>
<tr>
<td>KNMI (**) The Royal Netherlands Meteorological Institute</td>
<td>HCLIM38-AROME</td>
<td>2.5</td>
<td>RACMO</td>
<td>12</td>
<td>EC-Earth</td>
</tr>
<tr>
<td>ICTP (**) Abdus Salam International Centre for Theoretical Physics</td>
<td>RegCM4</td>
<td>3</td>
<td>RegCM4</td>
<td>12</td>
<td>HadGEM</td>
</tr>
<tr>
<td>CNRM (**) Centre National de Recherches Meteorologique</td>
<td>CNRM-AROME41t1</td>
<td>2.5</td>
<td>CNRM-ALADIN63</td>
<td>12</td>
<td>CNRM-CM5</td>
</tr>
<tr>
<td>KIT Karlsruhe Institute of Technology</td>
<td>CCLM5</td>
<td>3</td>
<td>CCLM4</td>
<td>12</td>
<td>MPI-ESM-LR</td>
</tr>
<tr>
<td>BTU Brandenburg University of Technology</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CNRM-CM5</td>
</tr>
<tr>
<td>ETHZ (**) (a) Federal Institute of Technology, Institute for Atmospheric and Climate Science</td>
<td>CCLM</td>
<td>2.2</td>
<td>CCLM4</td>
<td>12</td>
<td>pgw</td>
</tr>
<tr>
<td>ETHZ (**) (b) Federal Institute of Technology</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MPI</td>
</tr>
<tr>
<td>FZJ-IBG3-IDL Research Centre Julich Institute Dom Luis</td>
<td>WRF3.8</td>
<td>3</td>
<td>WRF3.8.1CA</td>
<td>15</td>
<td>EC-EARTH</td>
</tr>
<tr>
<td>DMI- MET Norway- SMHI (**) HARMONIE-Climate community</td>
<td>HCLIM38-AROME</td>
<td>3</td>
<td>HCLIM38-ALADIN</td>
<td>12</td>
<td>EC-EARTH</td>
</tr>
<tr>
<td>UNIGRAZ-WEGC Wegener Center for Climate and Global Change, University of Graz</td>
<td>WEGC-CCLM5</td>
<td>3</td>
<td>WEGC-CCLM5</td>
<td>12</td>
<td>MPI-ESM-LR</td>
</tr>
<tr>
<td>UK Met OFFICE (**) Met Office Hadley Centre Exeter</td>
<td>UM</td>
<td>2.2</td>
<td>No intermediate RCM</td>
<td></td>
<td>HadGEM</td>
</tr>
<tr>
<td>BCCR The Bjerknes Centre for Climate Research</td>
<td>WRF3.8</td>
<td>3</td>
<td>WRF3.8.1CA</td>
<td>15</td>
<td>NorESM1</td>
</tr>
</tbody>
</table>

- **12 member ensemble**
- **3x10 years length**
- **1 scenarios RCP8.5**
The first of this size European Regional Climate Model ensemble

Mean climate

Energy consumption

Agriculture

Health
Pluvial flooding

Drought
Hydrological model ensemble driven by Euro-CORDEX 0.11

- 44 member ensemble
- 150 years length
- 2 scenarios RCP2.6 and RCP8.5

The Convection Permitting Ensemble

Hourly precipitation:
- JJA
- SON

Intensity
Frequency
Extreme

Italy
France
Switzerland

From high resolution climate projections to the flood hazard map

We performed the flood extent simulation for a range of return periods using both historical and RCP8.5 data to estimate the flood change.

For \( T=500 \) yr, flooded area increases by 18\% in the North of Italy.

Central Italian flood extent will increase in the eastern coast, in line with the increase of maximum discharges.

Thanks!