CLIM-RUN Product Information Sheet: February 2014

Local climate change projections and associated uncertainty: The North Adriatic case study

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Target groups

- **Local/Regional Authorities**
- **Private Stakeholders**
- **Regional met offices**

Relevance to the case-study requirements

Climate variability and change in the Mediterranean basin and in the local sub-basins (such as the North Adriatic) is a subject of increasing interest to people in the region. However, the climate projections available for specific geographical areas such as the North Adriatic basin do not completely agree in the foreseen changes, in particular for the seasonal averages of rainfall. This does not automatically imply the unsuitability of such projections for decision making. Rather, such results could suggest that the North Adriatic lies in a 'transition' zone between those regions projected to become drier (i.e. the southern Mediterranean) and those projected to become wetter (Central-Northern Europe). Thus issues relating to uncertainty in climate projections associated with a multi-model ensemble approach (which is recommended good practice) need to be correctly communicated to end-users.

The approach

Regional Climate Models (RCMs) produce high-resolution (about 25 km) climate scenarios over selected areas by taking the input outside the Euro-Mediterranean domain from coarser resolution (more than 100 km) Global Climate Models (GCMs). RCMs should enhance the quality of climate projections with respect to GCMs, especially in the presence of complex orography (Artale et al., 2010) and in the proximity of coastal areas (Feser et al., 2011). In CLIM-RUN, we have evaluated climate change projections over the Euro-Mediterranean area using what is currently the largest and most consolidated ensemble of RCM simulations - produced during the EU-FP6 project ENSEMBLES (van der Linden and Mitchell, 2009). The adoption of different GCMs as global drivers allows us to take into account the effects of different large-scale weather regimes beyond the Euro-Mediterranean domain (such as the representation of the North Atlantic Oscillation) in the regional climate projections produced by RCMs. However, the figures presented overleaf show quite different projections even for regional simulations driven by the same GCM. This is likely due to the different capability of RCMs in reproducing regional processes and in performing dynamical downscaling.

The table shows (in blue) the 16 GCM-RCM combinations that have been extracted from the ENSEMBLES archive http://ensembles-eu.metoffice.com to develop these CLIM-RUN products.

Regional Model \ Global Model	HadCM3Q16	ARPEGE	BCM	ECHAM5-MPIOM r3	MIROC3.2 hires	HadCM3Q0
C4IRCA3	■					
CNRM-RM4.5		■				
DMI-HIRAM5		■	■	■		
ETHZ-CLM						■
ICTP-RegCM3				■		
KNMI-RACMO2				■	■	
METNO-HIRAM			■			■
METO-HC HadRM3Q0						■
MPI-M-REMO				■		
SMHIRCA			■	■		
UCLM-PROMES						■

References
Artale et al., 2010. An atmosphere-ocean regional climate model for the Mediterranean area: assessment of a present climate simulation Climate Dynamics doi:10.1007/s00382-009-0691-8
Feser et al., 2011. Regional climate models add value to global model data". Bulletin of the American Meteorological Society 92. 1181-1192.
van der Linden P., and J.F.B. Mitchell , 2009. ENSEMBLES: Climate Change and its Impacts: Summary of research and results from the ENSEMBLES project. Met Office Hadley Centre, FitzRoy Road, Exeter EX1 3PB, UK. 160pp

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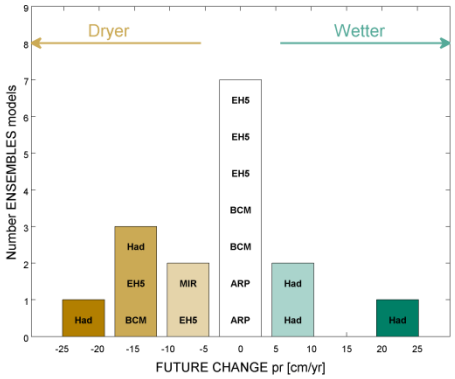
The products

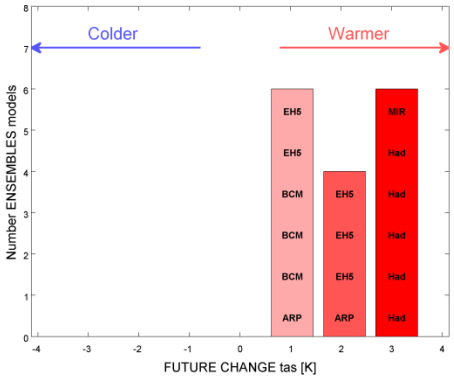
The figures below show projected changes (for the period 2041-2050 compared to 1971-1980) in average **rainfall**, **temperature,** and **wind speed** over the North Adriatic for summer (top) and winter (below). Each bar indicates the number of Regional Climate Models (RCMs – from a total of 16) producing a change of a given amplitude. The labels inside the bars represent the global climate models (GCMs) adopted as drivers outside the Euro-Mediterranean region for the corresponding regional downscaling.

North Adriatic- projected changes in summer averages

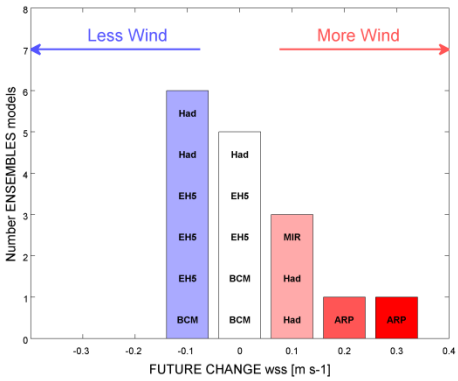
Rainfall



Temperature



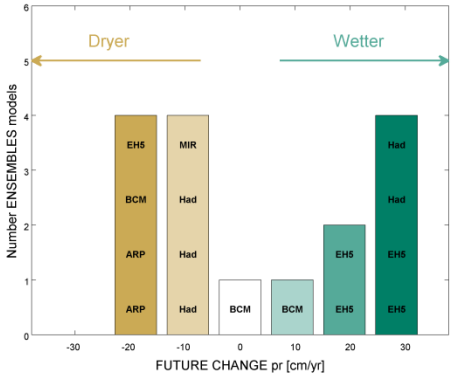
Wind speed



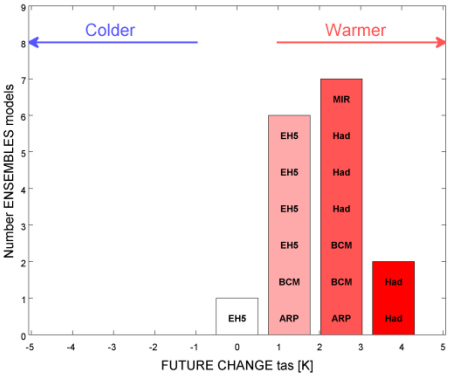
The RCM simulations for summer generally agree that an increase in average temperature of between 1 and 3°C could be reasonably expected. Regarding average wind speed and rainfall, weaker agreement is exhibited, although many of the models indicate little or no change in average summer rainfall.

North Adriatic- projected changes in winter averages

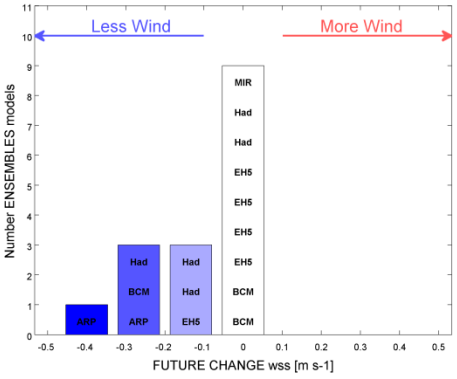
Rainfall



Temperature



Wind speed



The RCM simulations for winter generally agree that an increase in average temperature of between 1 and 4 °C could be reasonably expected with perhaps slightly weaker winds. Regarding winter rainfall a weaker agreement is exhibited with half of the simulations projecting a decrease and the other half a substantial increase of winter rainfall.

Making the product usable

The CLIMRUN team is seeking collaborations with end users in the North Adriatic region who are interested in using and further developing the information presented here for decision making and risk management. Some areas for further development and potential cooperation include:

- The derivation of tailored indices based on end users' needs Analysis of statistics of extremes (such as droughts, heavy rainfall, heat waves)
- Assessment of changes in the risk of exceeding critical thresholds

This information sheet was developed in the framework of the CLIM-RUN FP7 EU project. The product it describes should not be used without acknowledging the project and, particularly for any operational use, interaction with the authors is welcome and strongly encouraged.

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