CLIM-RUN Product Information Sheet: February 2014

Local climate change projections and associated uncertainty in the representation of intense sea level pressure events: 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 numerical climate projections available for specific geographical areas such as the North Adriatic basin do not completely agree in the foreseen changes, in particular in the future projections of intense events characterised by large negative anomalies of sea level pressure. The results shown here do indeed suggest that over the North Adriatic region, any change in this type of intense event is uncertain before the mid-century using the current generation of climate models. 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 and considered when assessing potential changes in risk.

The approach

The intense anomalies of daily sea level pressure, likely connected with storm surge events over the North Adriatic, have been identified since the early stage of the CLIM-RUN project as very relevant information for the involved end users. To analyse climate projections for the occurrence of such kind of intense events we have considered a multi-model ensemble of Regional Climate Models (RCMs) that produce high-resolution (about 25 km) climate scenarios by taking the input outside the Euro-Mediterranean domain from coarser resolution (more than 100 km) Global Climate Models (GCMs). RCMs 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 CLIMRUN, 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 outside the Euro-Mediterranean domain (for instance the representation of the North Atlantic Oscillation) on the regional climate changes projected by RCMs. However, the figure overleaf shows quite different projections from regional simulations driven by the same GCMs. This is likely due to the different capability of RCMs in reproducing regional processes and in performing dynamical downscaling.

The table shows (in green) the 16 GCM-RCM combinations that have been extracted from the ENSEMBLES archive http://ensembles-eu.metoffice.com to develop the CLIM-RUN products about daily sea level pressure anomalies.

Regional Model \ Global Model	HadCM3Q16	ARPEGE	BCM	ECHAM5-MPIOM r3	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

Dell'Aquila A., Calmanti S., Ruti P. M., Struglia M. V., Pisacane G., Carillo A., Sannino G., 2011 Impacts of seasonal cycle fluctuations in an A1B scenario over the Euro-Mediterranean. Climate Research doi:10.3354/cr01037

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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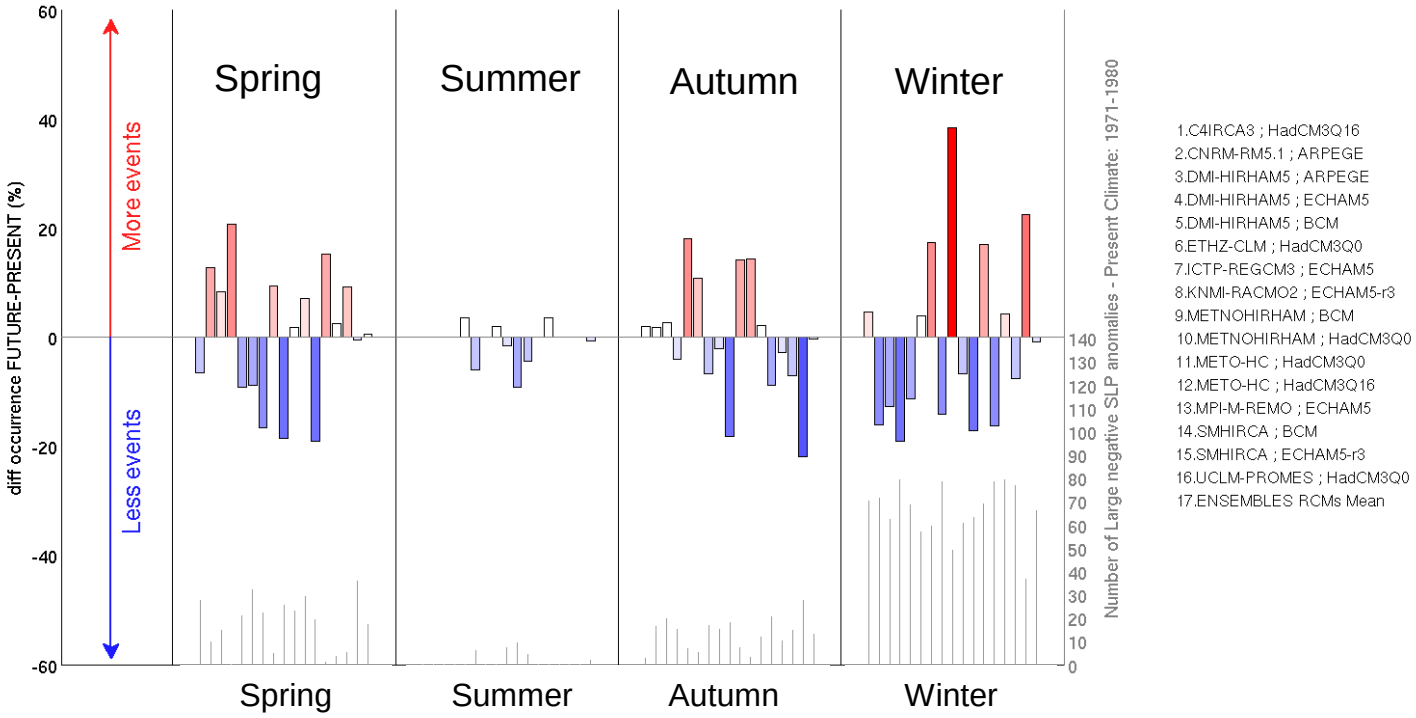
CLIM-RUN

The product

NORTH ADRIATIC changes in the frequency of large negative anomalies of sea level pressure 2041-2050 vs 1971-1980



Projected changes averaged over the period 2041-2050 compared with 1971-1980 in the occurrence of **intense negative anomalies of sea level pressure over North Adriatic** simulated by ENSEMBLES Regional Climate Models (RCMs). Intense events are defined here as those whose anomaly values exceed the threshold, arbitrarily set to 2 standard deviations (an indicator of temporal variability) below the reference seasonal cycle of present climate as described in each simulation (this definition seeks to emphasize the occurrence of anomalies regardless of any bias in the RCMs - see also Dell'Aquila et al 2011). The thin grey bars indicate the number of events (right-hand axis) in the present climate for each RCM simulation (listed in the order shown on the right with the corresponding global drivers) for different seasons. The colour bars indicate the changes in the occurrence (in percent) of the intense events (left-hand axis). In all seasons the models do not fully agree in the projected changes of occurrence of intense events – either in terms of the direction (an increase or a decrease) or magnitude (ranging from about -20% to +40%) of change. All summer changes are negligible.

Making the product usable

The CLIMRUN team is seeking collaborations with end users in the North Adriatic in order to explore how this product (and others developed within the project for other weather variables) can be used to inform decision making and risk assessment. For this particular product, for example, the team can discuss with users how the projected changes might translate into changes in the occurrence of storm surges and other extreme weather events.

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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