ADVANCED WIND RESOURCE RISK MANAGEMENT:
Local long-term wind speed scenarios
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CLIM-RUN

Keywords: Wind, Renewable Energy, Investments

Target groups	Relevance to the case-study requirements
➢ **Energy** ➢ **Professional organisations and federations** ➢ **Regional authorities**	Most of the interest concerning wind modelling focuses on the very short-range (nowcasting) and on seasonal forecasts, because the largest part of the manageable risk is concentrated on these time-scales. However, the interaction with stakeholders, especially in the energy sector, has highlighted the need for more in-depth understanding of wind modelling capacities at a longer time scale, which may contribute to both site evaluation in the absence of very accurate wind atlases and to the assessment of risks that may affect the return on investments on longer time scales.

The approach

Regional Climate Models (RCMs) produce 16 high-resolution (about 20 km) climate scenarios over selected areas by taking the input at the lateral boundaries from coarser resolution (about 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 wind modelling 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 table shows (in blue) the GCMs-RCMs combinations that have been extracted from the ENSEMBLES archive to develop the CLIM-RUN products on wind scenarios.

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 Clim. Dyn. doi:10.1007/s00382-009-0691-8
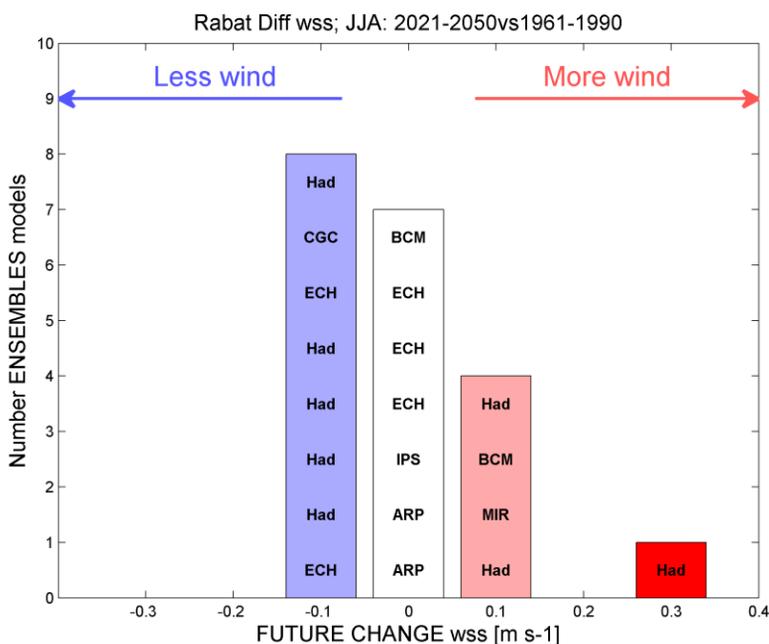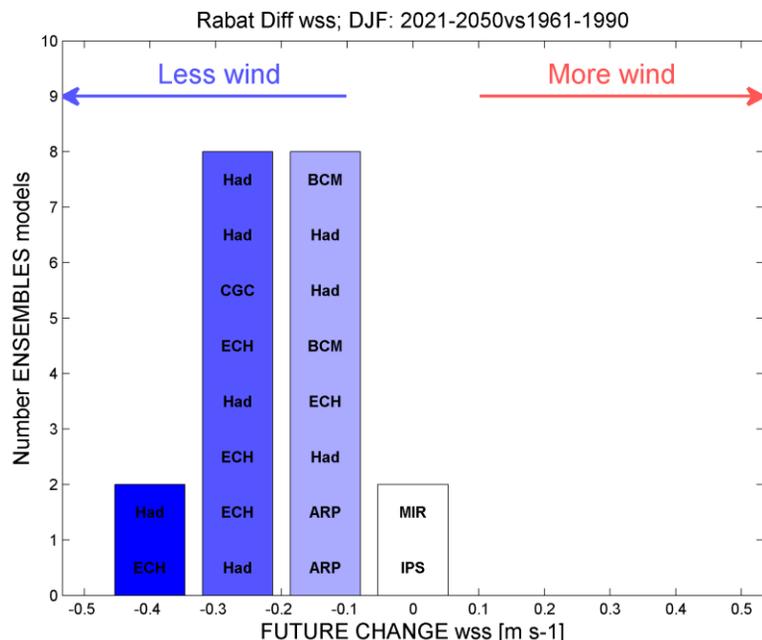
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van der Linden P., and J.F.B. Mitchell , 2009. ENSEMBLES: Climate Change and its Impacts: Summary of research and results from the ENSEMBLES project. Met Office Hadley Centre, FitzRoy Road, Exeter EX1 3PB, UK. 160pp

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The product

Rabat Diff wss; DJF: 2021-2050vs1961-1990

Rabat Diff wss; JJA: 2021-2050vs1961-1990

Distribution of projected changes in wind speed (m/s) over Rabat, Morocco, during winter (top panel) and summer (bottom panel).

Wind speed changes are derived from the regional downscaling of A1B greenhouse gas emissions scenario performed during the EU-FP6 project ENSEMBLES. Projected changes for 2021-2050 against 1961-1990 are shown.

Each bar indicates the number of RCMs (out of 16) producing a wind speed change of a given amplitude for Rabat. The labels inside the bars represent the GCMs adopted as global drivers for the corresponding regional downscaling.

The prevalence of a particular GCM in one of the bars indicates that a given change in wind speed is mainly attributed to a specific global driver (suggesting no model consensus and that the result is less robust).

A mixture of GCMs in one of the bars indicates that a given change in wind speed does not depend on the adoption of a specific global driver (i.e. model agreement and result is more robust).

Making the product usable

The CLIM-RUN team is seeking collaborations with stakeholders in the energy sector to make this climate product usable. Areas for potential cooperation include:
• Derivation of tailored indices based on wind speed products
• Statistics of extremes
• Critical thresholds
• Calibration of climate models to specific wind energy sites.

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