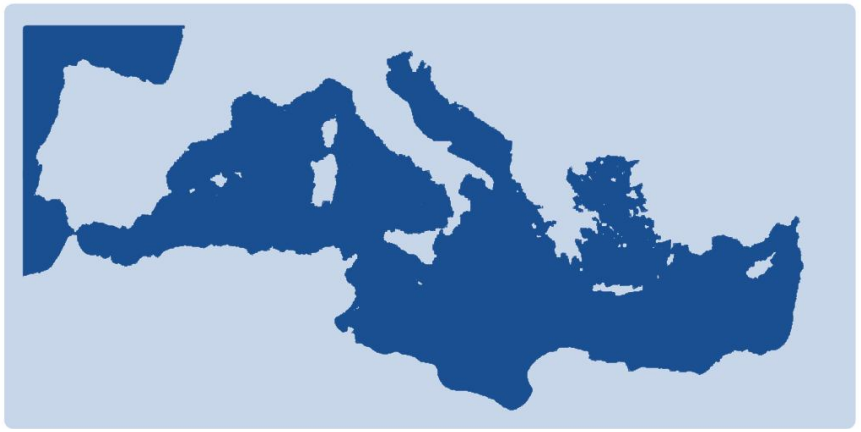
Climate Local Information in the Mediterranean region Responding to User Needs



CLIM-RUN

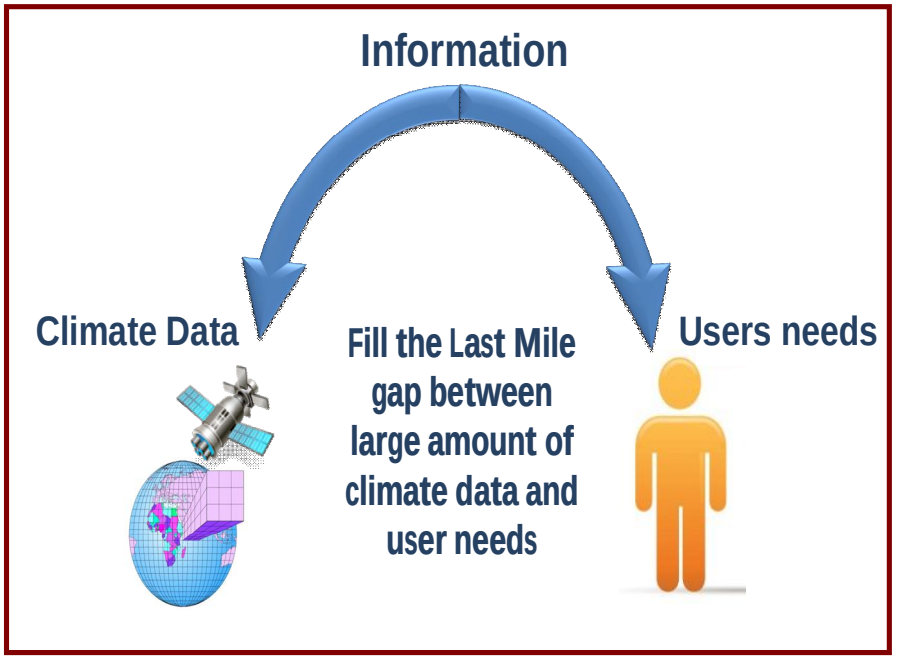
Climate information for the wind energy industry in the Mediterranean Region: from ENSEMBLES to MED-CORDEX

Alessandro Dell'Aquila, ENEA
Sandro Calmanti, ENEA
Melanie Davies, IC3
Peter Schmidt, PIK

What is CLIM-RUN?

CLIM-RUN (2011-2014) Objectives

- Design and implementation of a **Climate Services protocol** for optimizing the **two-way information transfer** (bottom-up /up-bottom) between climate experts and stakeholders
- Advancement of the **science underpinning** the production of detailed **climate information** at regional to local scales tailored for **stakeholder needs**
- Test of the protocol via its application to a number of real world **case studies** in the **Mediterranean area** (mainly on Energy & Tourism and Natural hazards)



www.climrun.eu

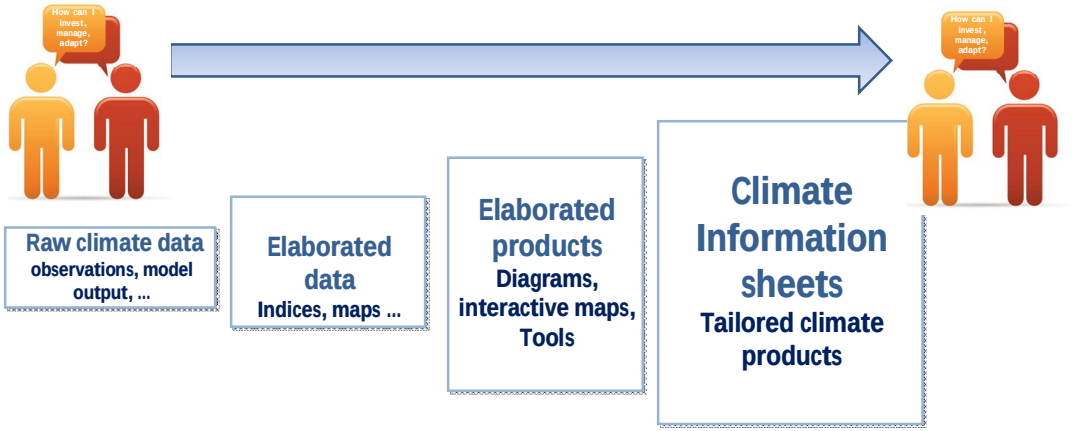
What is CLIM-RUN?

CLIM-RUN Case studies

Early involvement of stakeholders : First Stakeholder workshops

Iterative consultation and collaboration with stakeholders

Consolidation and collective review/assessment : Second Stakeholder workshops



Tourism: Tunisia, France, Cyprus, Croatia

Energy: Spain, Morocco, Cyprus, Croatia

Wild Fires: Greece *(see 17.45 presentation Climate change and wildfire risk by C. Giannakopoulos et al.)*

Integrated Case Study: North Adriatic

More info & gadgets in Poster Area 2 at Poster FF11

"*New perspectives and products from the CLIM-RUN project: continuing and developing the engagement with Mediterranean stakeholders*"

Climate information for the wind energy: MOTIVATION

- During the first phase of EU-FP7 CLIMRUN project, **wind speed** has been identified as a key climate variable of interest for the case studies on energy that cover the Greater Mediterranean region involving Morocco, Spain and Cyprus.

- 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.

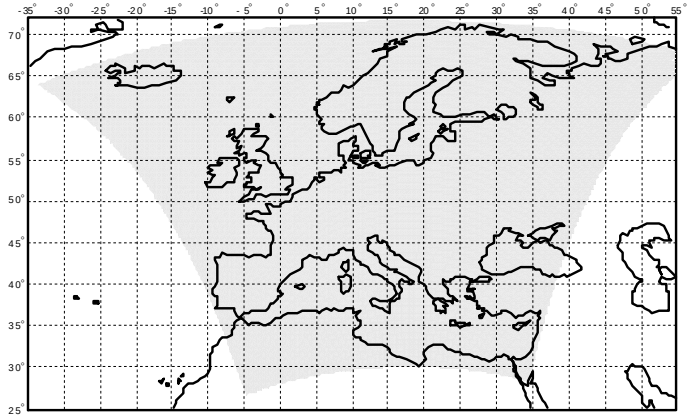
- However, the interaction with stakeholders, especially in the energy sector, has highlighted the need for more in depth understanding of wind modelling capacities at a longer time scale, which may contribute to both site evaluation in the absence of very accurate wind atlases and on the assessments of risks that may affect the return on investments on longer time scale

ENSEMBLES RCMs DATA

ENSEMBLES FP6 GCMs-RCMs MATRIX

Regional Model	ERA40	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							■

ENSEMBLES domain

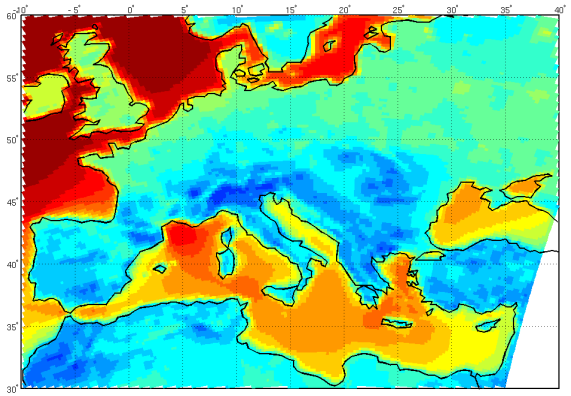


The table shows the GCMs-25Km RCMs combinations extracted from the ENSEMBLES archive to develop the CLIMRUN products on wind scenarios.

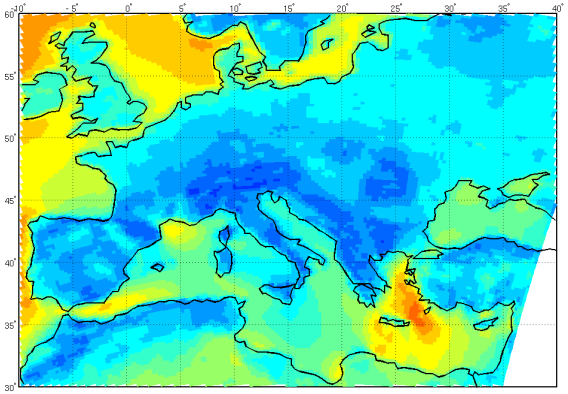
QuikSCAT LEVEL3 observational dataset. This dataset has a global coverage at daily frequency and a horizontal resolution of 0.5° x 0.5° (over sea).

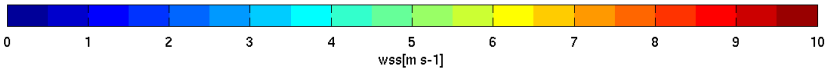
ENSEMBLES: VALIDATION

ENSEMBLES RCMs 25Km ERA40 Mean DJF



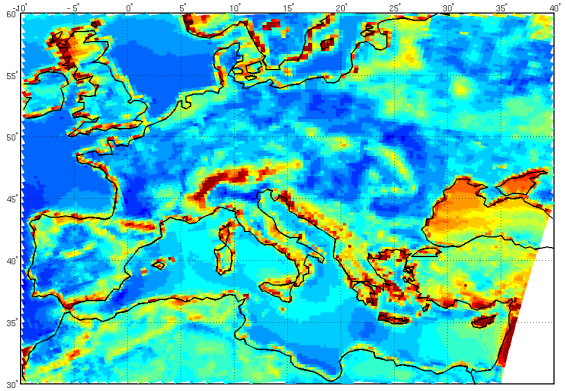
ENSEMBLES RCMs 25Km ERA40 Mean JJA



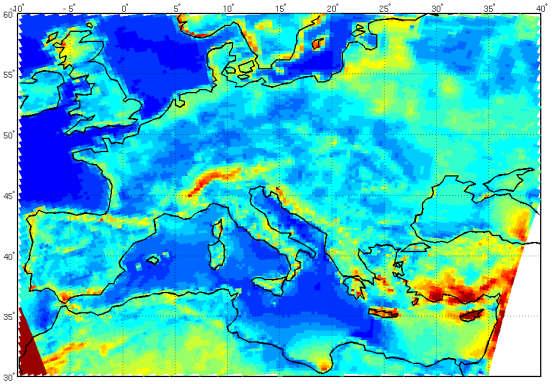


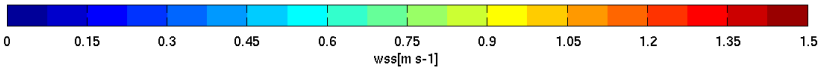
DJF and JJA wind speed ensemble seasonal average for ENSEMBLES RCMs ERA40 simulations.

ENSEMBLES RCMs 25Km ERA40 SPREAD DJF



ENSEMBLES RCMs 25Km ERA40 SPREAD JJA

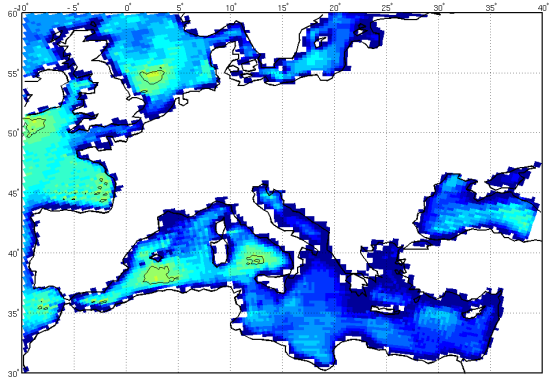




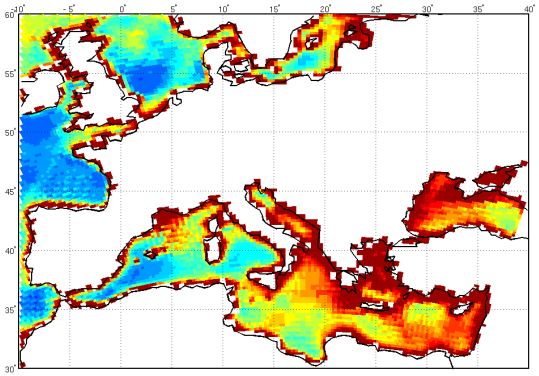
Spread of the ENSEMBLES ERA40 RCMs simulations for the wind speed seasonal average for DJF and JJA

ENSEMBLES: VALIDATION vs QuikSCAT

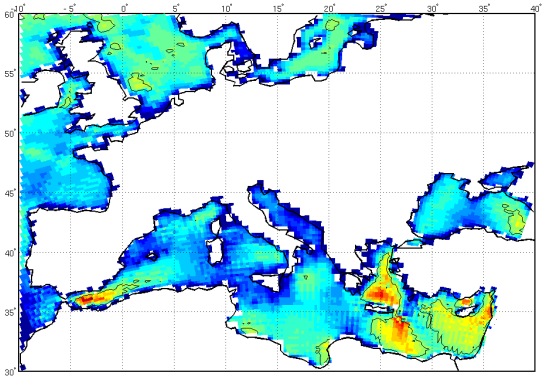
Bias Ensembles RCMs ERA40 25km vs Quikscat DJF



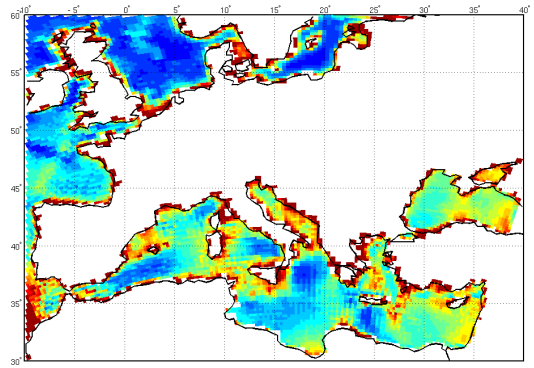
RMSE Ensembles RCMs ERA40 25km vs Quikscat DJF

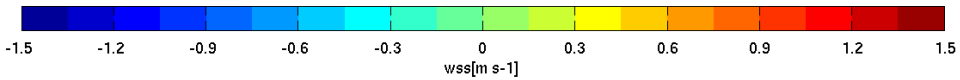


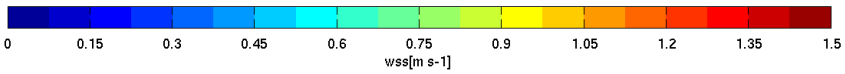
Bias Ensembles RCMs ERA40 25km vs Quikscat JJA



RMSE Ensembles RCMs ERA40 25km vs Quikscat JJA





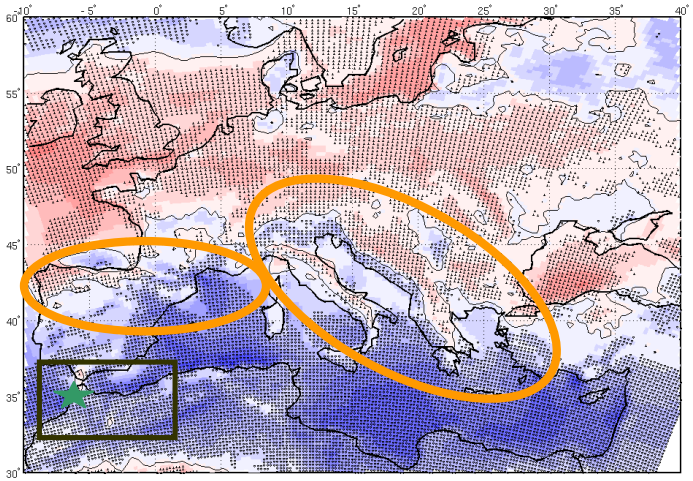


Bias of the ENSEMBLES RCMs ERA40 simulations against QuikSCAT in winter and summer periods.

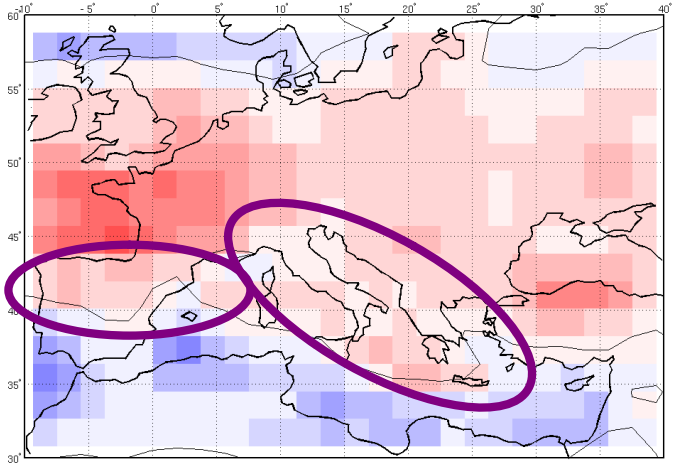
RMSE of the ENSEMBLES RCMs ERA40 simulations against QuikSCAT data in winter and summer periods.

ENSEMBLES: SCENARIO

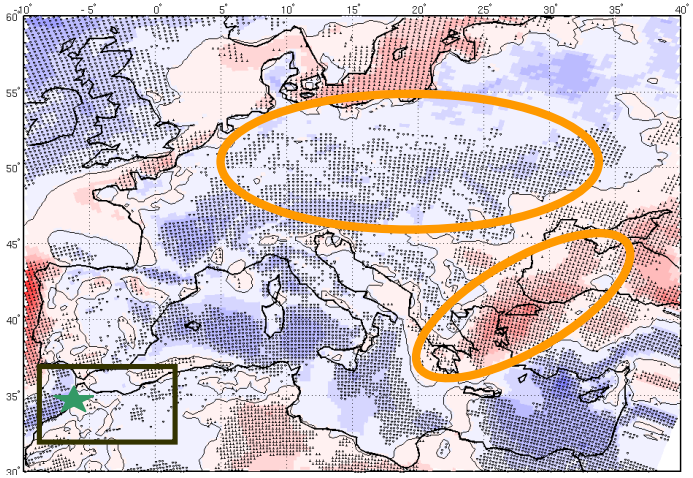
A1B RCMs wind speed changes 2021-2050 vs 1961-1990; DJF



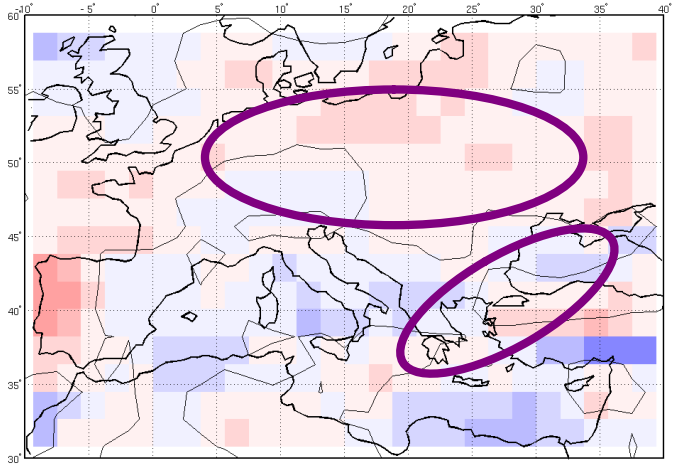
A1B GCMs wss changes 2021-2050 vs 1961-1990; DJF

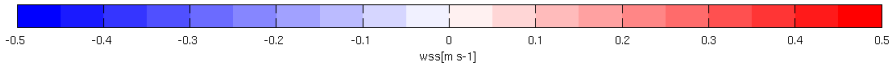


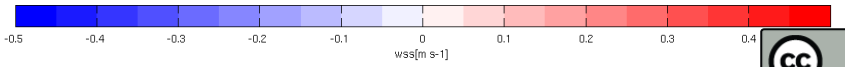
A1B RCMs wind speed changes 2021-2050 vs 1961-1990; JJA



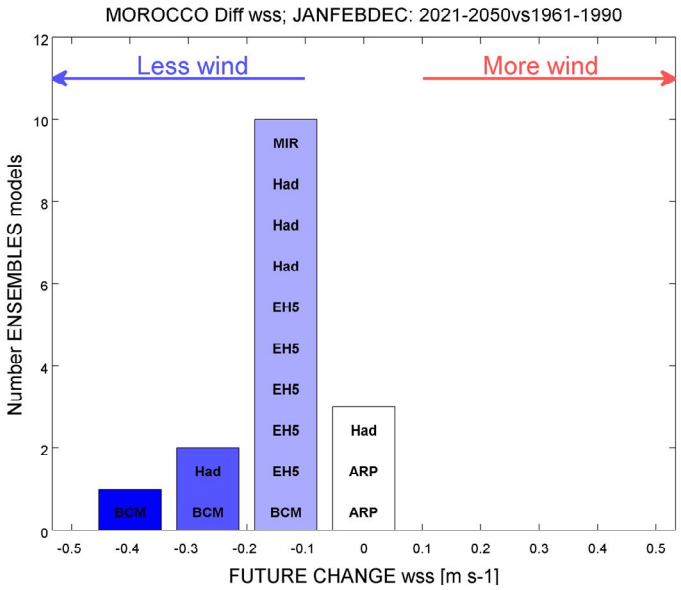
A1B GCMs wss changes 2021-2050 vs 1961-1990; JJA

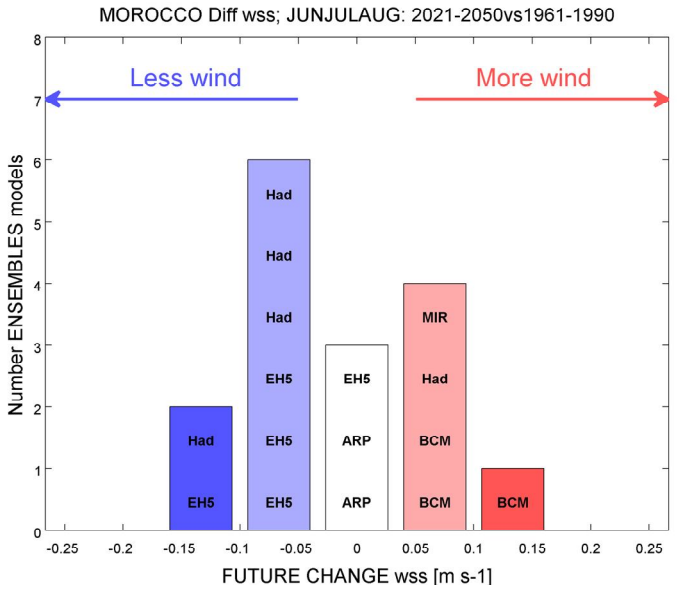


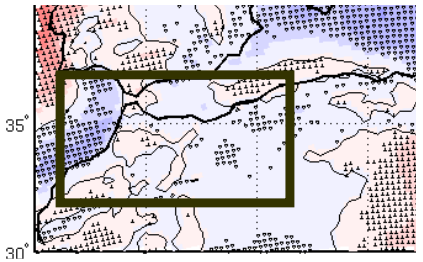


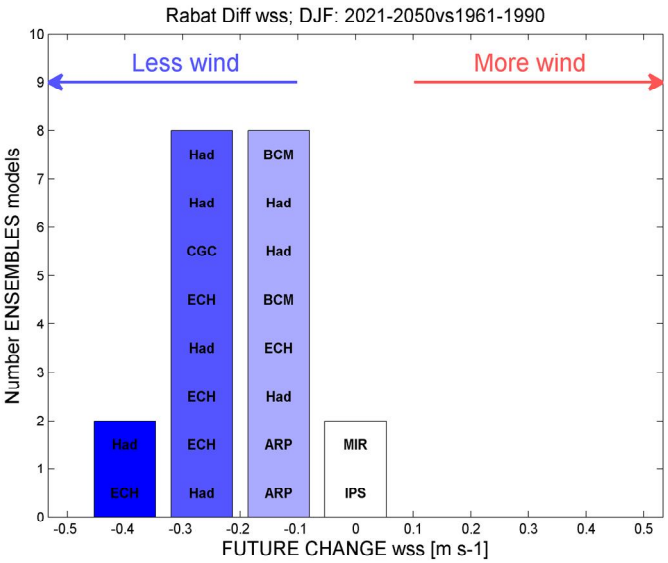


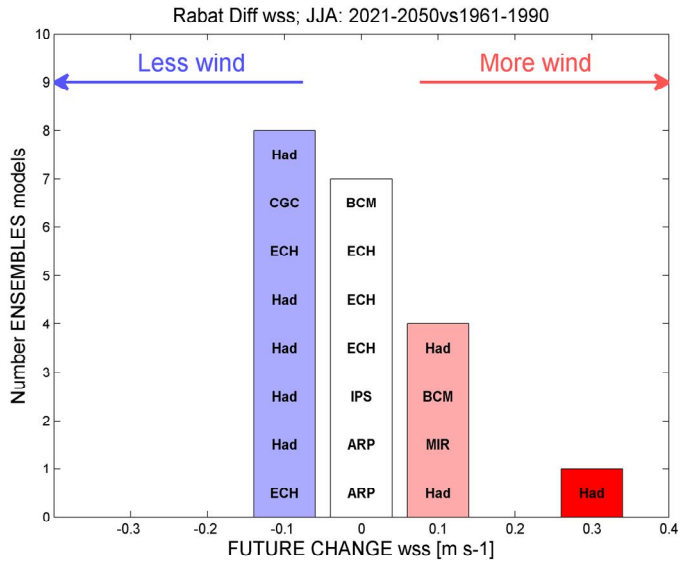
ENSEMBLES: Climate information

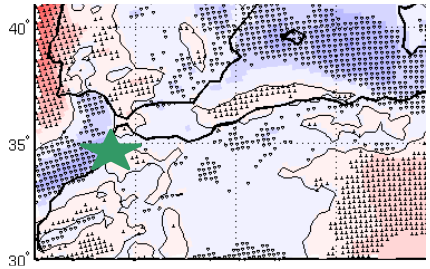












A first step forward: MED-CORDEX

MedCORDEX - CORE simulations Atmosphere-RCM: MED-44 (50km, 0.5°)				ERAI	ERA40	HIST	RCP8.5	RCP4.5
				1979-now	1958-2001	1950-2005	2006-2100	2006-2100
RUN	institute	model	resol.					
	ITU	RegCM4	50km	1989-2008				
	ENEA	RegCM3.1	30km	1982-2010	1958-2001			
	ICTP	RegCM4	50km	1989-2008	1958-2001	1950-2005	2006-2100	2006-2100
	MPI	REMO	50km	1989-2008	1958-2001			
	CNRM	ALADIN5.2	50km	1979-2012	1958-2001	1950-2005	2006-2100	2006-2100
	LMD	LMDZ	30km	1979-2009	1958-2001			
	Univ. Belgrade	EBU	50km	1989-2008				
	IPSL	WRF3.1.1	50km	1989-2008		1971-2005	2006-2070	
	UCLM	PROMES	50km	1989-2008				
	GUF	CCLM4-8-11	50km	1989-2008*				
	CMCC	CCLM4-8-19	50km	1979-2008		1950-2005		2006-2100
	IMS/TAU	CCLMx-x-xx	50km	1979-2010				

unknown planned done archived

*: 1979-2008, planned

www.medcordex.eu

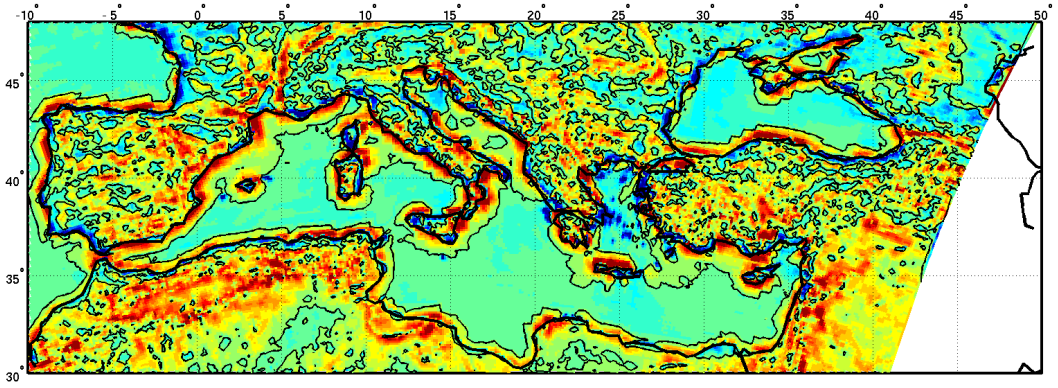
MedCORDEX – TIER1 simulations Atm.-RCM: MED-11 (12 km, 0.11°)				ERAI	ERA40	HIST	RCP8.5	RCP4.5
				1979-now	1958-2001	1950-2005	2006-2100	2006-2100
RUN	institute	model	resol.					
	ITU	RegCM4	15km					
	ICTP	RegCM4	12km			1970-2005	2006-2050	
	MPI	REMO	12km					
	CNRM	ALADIN5.2	12km	1979-2012		1950-2005	2006-2100	2006-2100
	UCLM	PROMES	12km	1989-2008				
	GUF	CCLM4-8-18	10km	1989-2008				

High resolution simulations

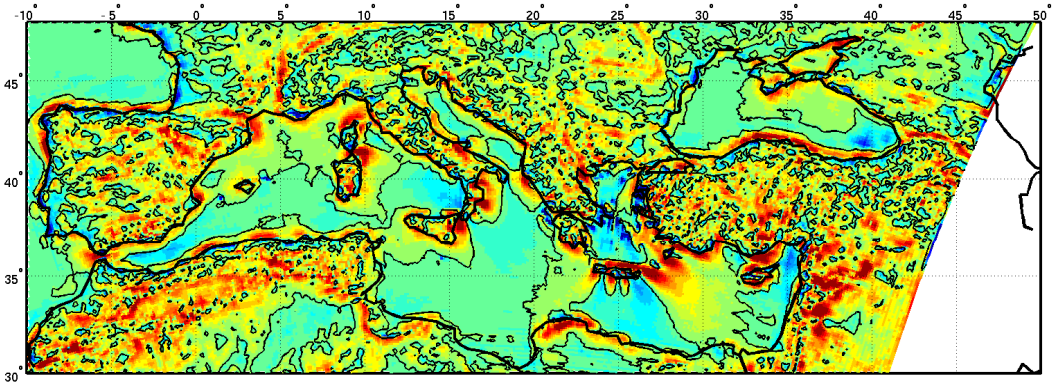
A first step forward: MED-CORDEX (preliminary analysis)

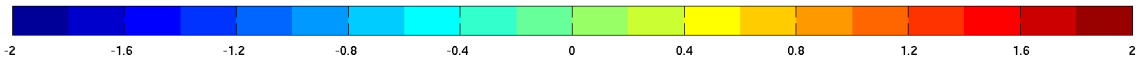
A matter of resolution…

CNRM: MED11-MED44; DJF



CNRM: MED11-MED44; JJA





12 km vs 50 km

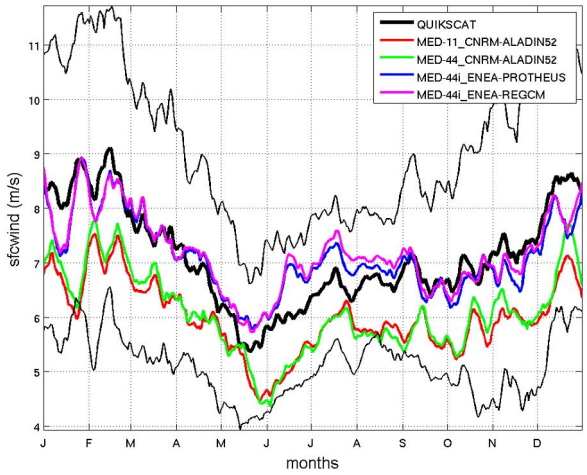
see also
Hermann et al 2011

A first step forward: MED-CORDEX (preliminary analysis)

ERAINT Validation simulations

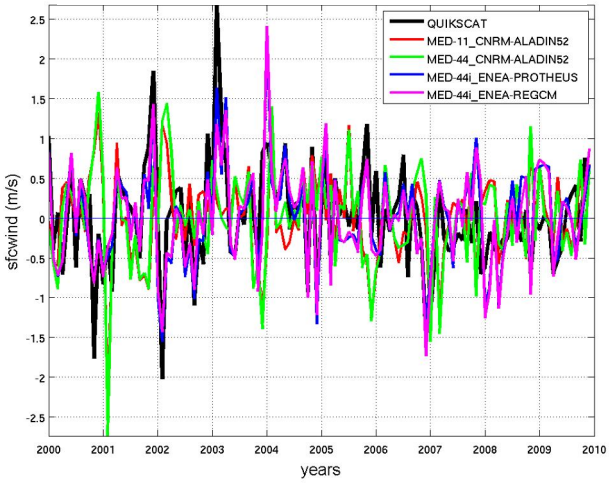
a)

Seasonal cycle



b)

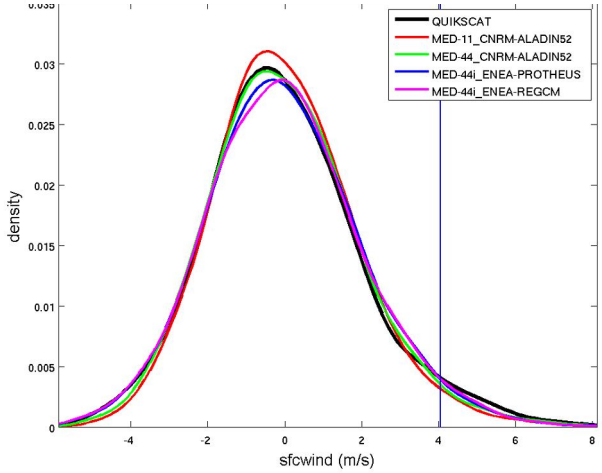
Interannual variability



AEGEAN SEA

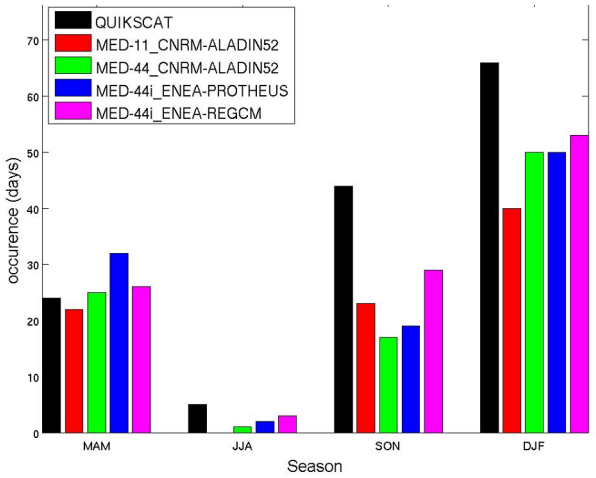
c)

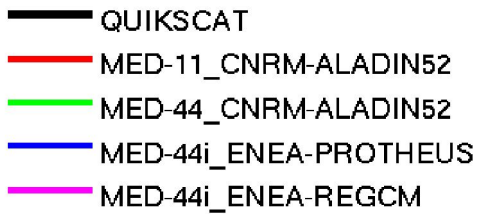
Distribution of wind anomalies



d)

Seasonality strong wind events





Summarising.....

- Relevance of wind speed in CLIMRUN energy case studies
- Idea of uncertainty in climate modelling especially over specific areas (i.e. complex orography)
- Climate information tailored for user's needs (maps & local histogram plots)
- Climate signal in GCMs vs RCMs. Who's right? (assess the added value of dynamical downscaling)
- Role of high resolution along the coasts (new MED-CORDEX simulations
- Transfer function for stakeholders (i.e. wind power)