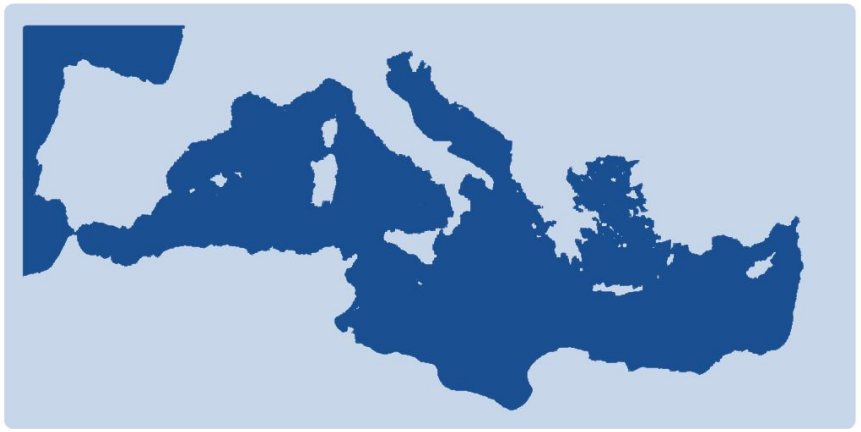
Climate Local Information in the Mediterranean region Responding to User Needs



CLIM-RUN

Climate services for energy production: are regional climate models reliable for future solar power generation scenarios?

A. Dell'Aquila, UTMEA-CLIM, ENEA
S. Calmanti, UTMEA-CLIM, ENEA
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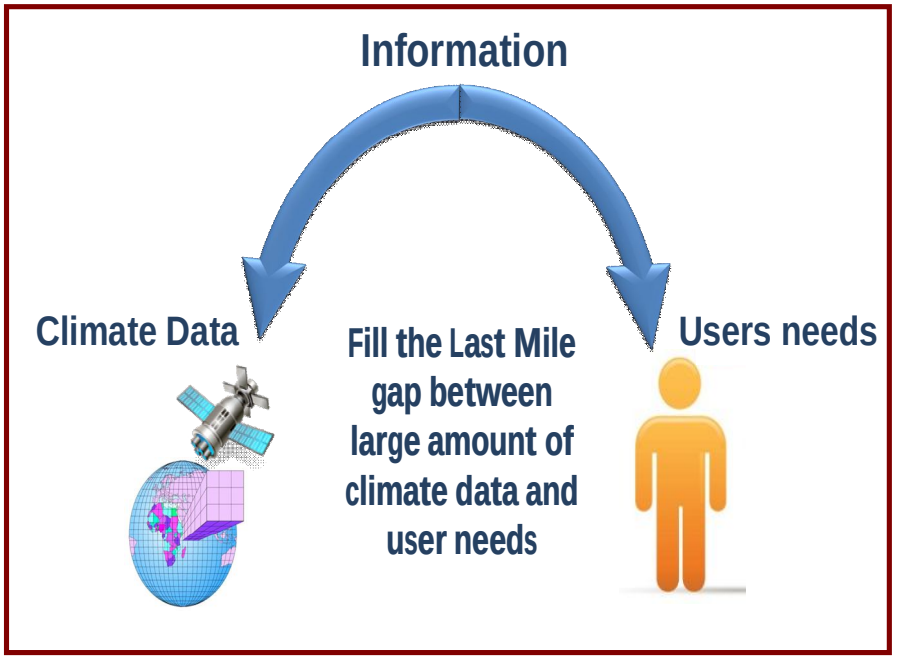
M. Castelli, EURAC, University of Trento

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)



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What is CLIM-RUN?

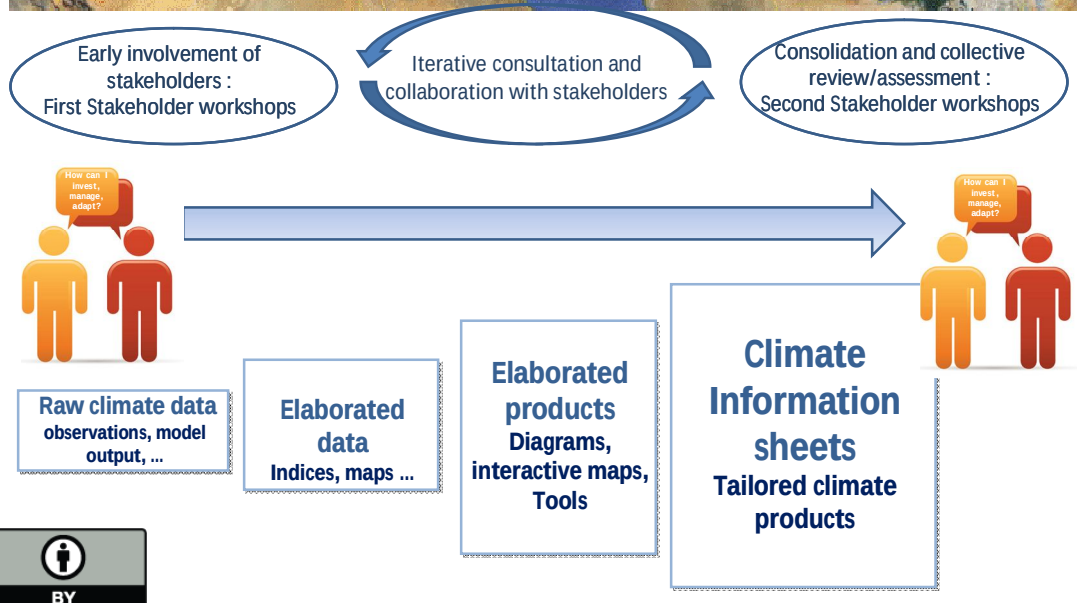
CLIM-RUN Case studies

Tourism: Tunisia, France, Cyprus, Croatia

Energy: Spain, Morocco, Cyprus, Croatia

Wild Fires: Greece

Integrated Case Study: North Adriatic



Downward solar radiation has been identified as one of the relevant climate variables of interest for Energy case studies

The Approach: ENSEMBLES DATA

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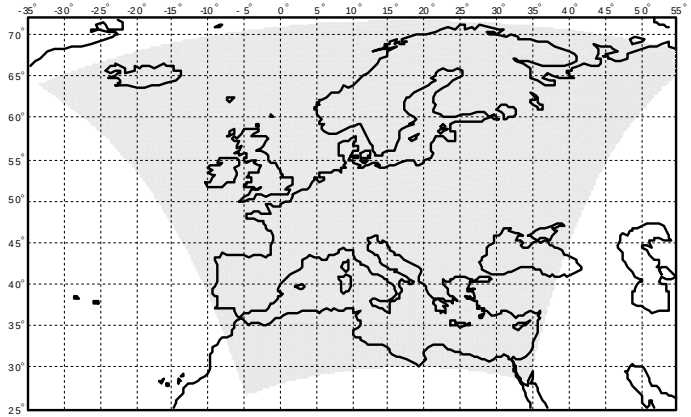
ENSEMBLES FP6 GCMs-RCMs MATRIX

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 future solar power generation scenarios

ENSEMBLES RCMs details

Institute	Model	# Lev	H. Res	Solar Const.	Aerosols
C4I	RCA3	31	25km	´365 W/m²	Equivalent CO2
CHMI	Aladin CY28t3	27	50km	Constant	Equivalent CO2
CNRM	Aladin 4.5	31	50km	Standard	Tegen et al 1997
CRCM	OURANOS 4.2.3	29	50km-25km	´365 W/m²	Boucher, M. Pham (2002), JGR
DMI	n.a.	n.a.	25km	n.a.	n.a.
ETHZ	CLM 2.4.6	32	25km	´368 W/m²	J.F. Geleyn, ECMWF, 4.11.1982
GKSS	CLM 2.4.6	32	50km	´368 W/m²	J.F. Geleyn, ECMWF, 4.11.1982
HC	HadRM3.0	19	50km 25km	´365 W/m²	SO2 and DMS: Stott et al 2006 Oxidants: Johns et al 2003
ICTP	RegCM3	19	25km	´365 W/m²	Briegleb 1992 (JGR)
INM	RCA3	31		´365 W/m²	Equivalent CO2
KNMI	RACMO2.1	40	25km 50km	´370 W/m²	four types of aerosols according to Tanré (1984)
MET.NO	HIRHAM2	31	25km	´376 W/m²	aerosols from ECHAM4 (constant curing 1960-2000)
SMHI	RCA3	24	25km 50km	´370 W/m²	Constant
UCLM	PROMES	28	50km	´395.6 W/m²	Not Considered

ENSEMBLES Scenario A1B

changes (2021-2050) vs (1961-1990)

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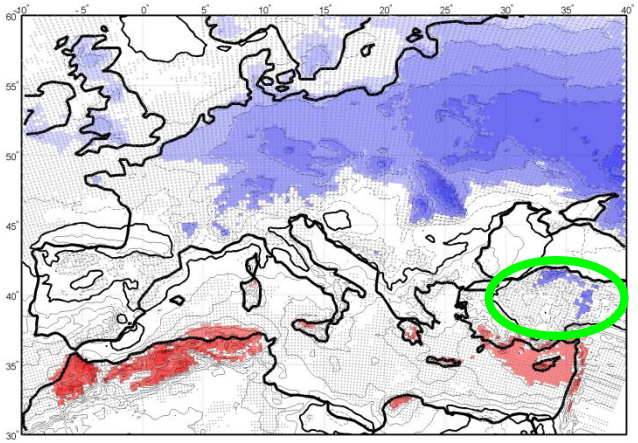
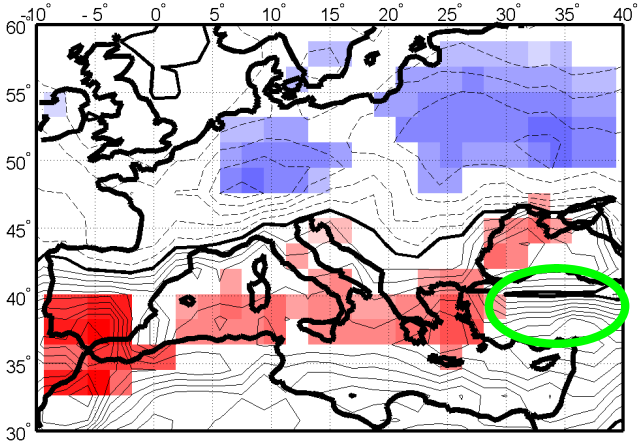
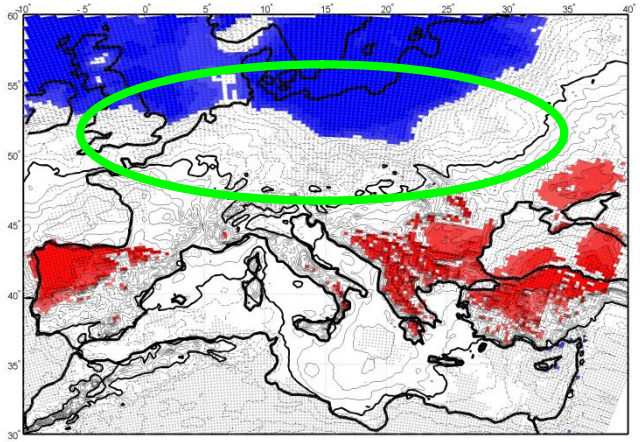
rsds RCMs ENSEMBLES DJF



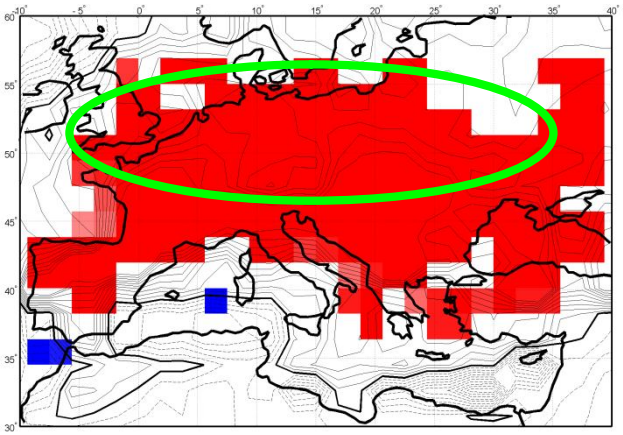
rsds GCMs ENSEMBLES DJF

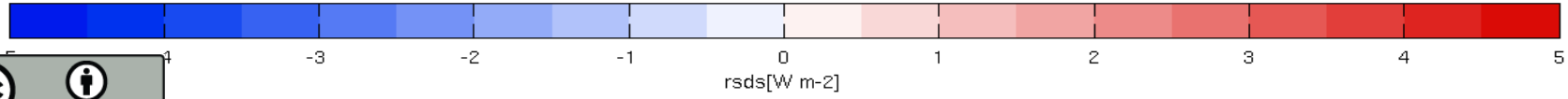


rsds RCMs ENSEMBLES JJA



rsds GCMs ENSEMBLES JJA



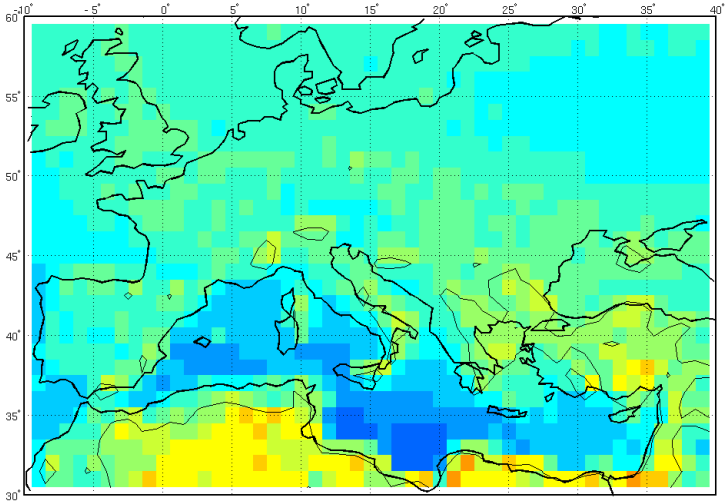


Validation: RCMs ERA40 simulations vs NASA

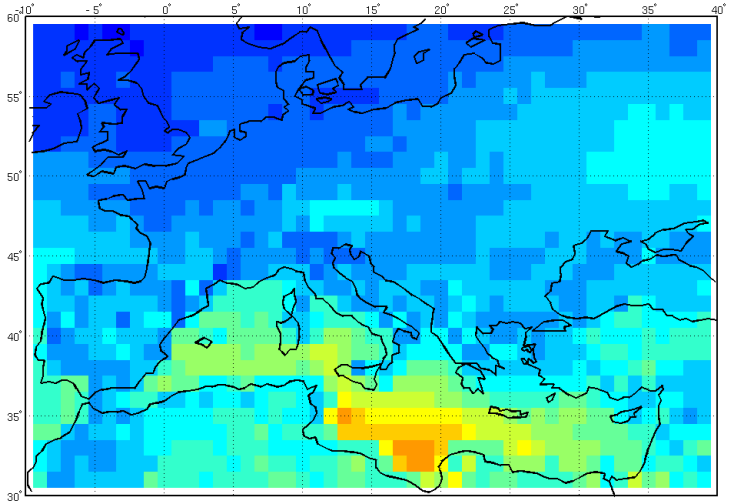
ENSEMBLES RCMs representation of seasonal averages vs

NASA GEWEX SRB (Surface Radiation Budget, 1983-2007) 1°x1° resolution

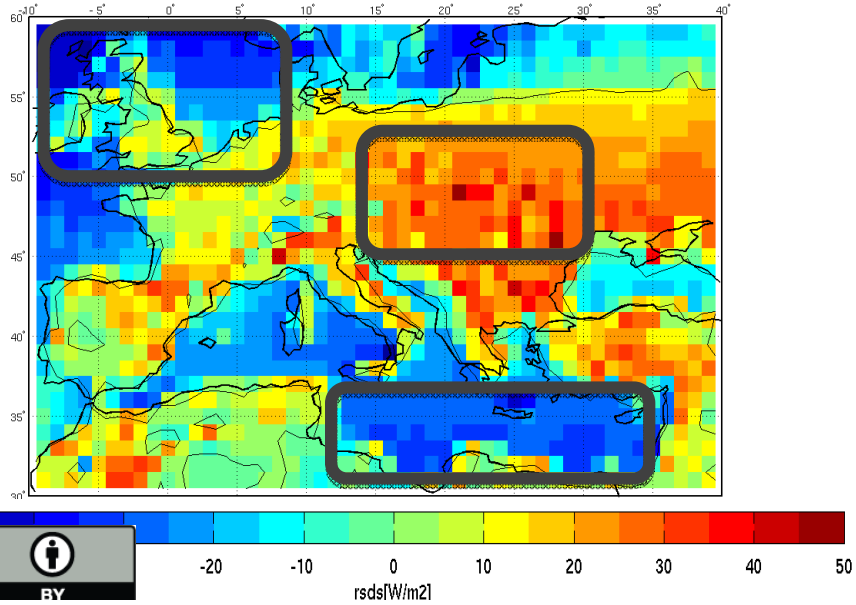
Bias ENSEMBLES RCMs ERA40 vs NASA; rsds DJF



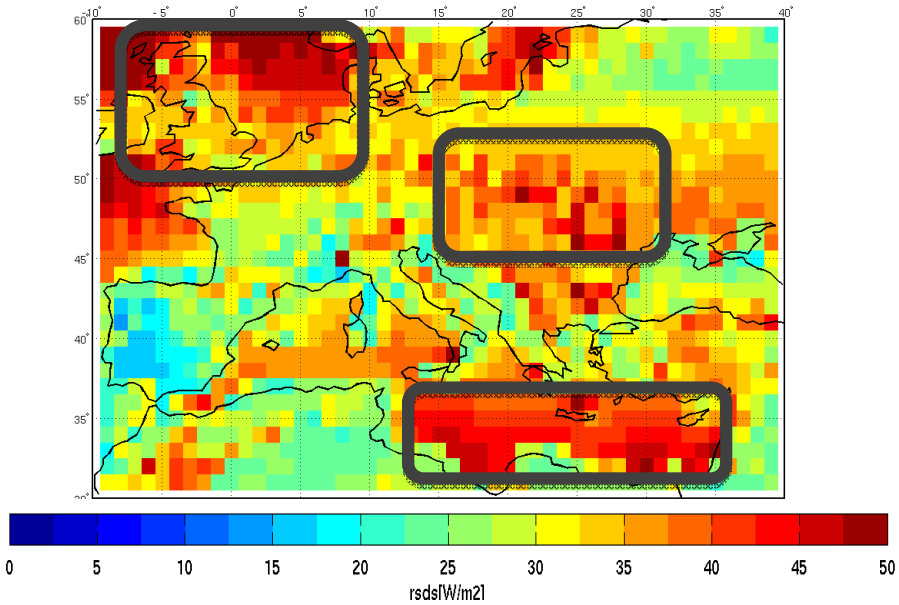
RMSE ENSEMBLES RCMs ERA40 vs NASA; rsds DJF



Bias ENSEMBLES RCMs ERA40 vs NASA; rsds JJA



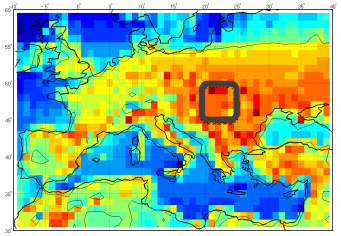
RMSE ENSEMBLES RCMs ERA40 vs NASA; rsds JJA



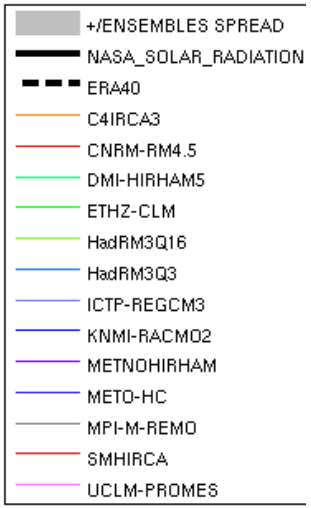
Validation: RCMs ERA40 simulations vs NASA

Representation of interannual variability

CLIM-RUN



DJF



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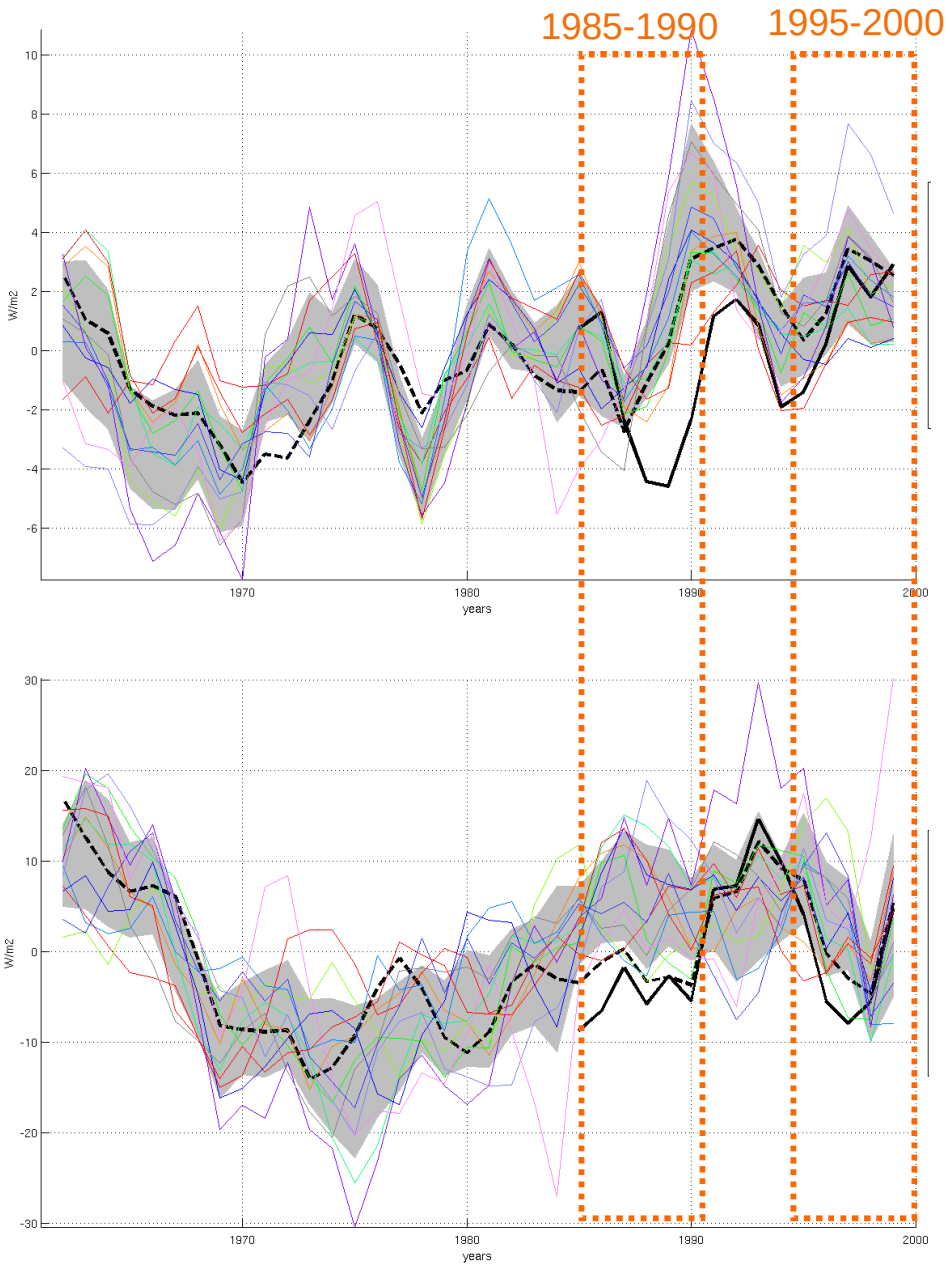
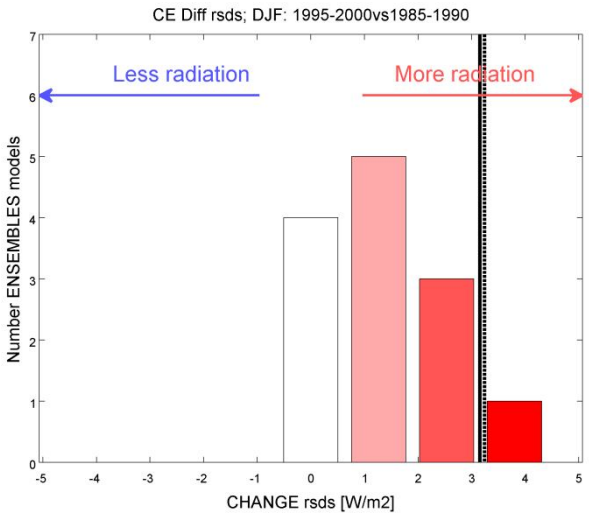
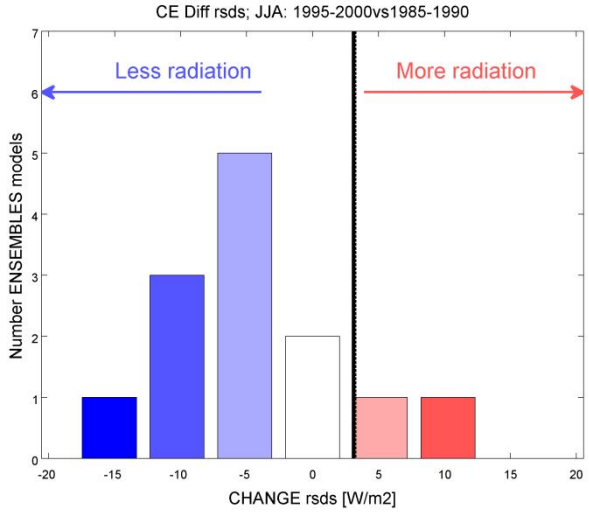


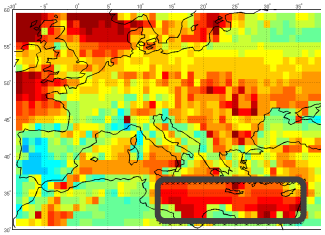




Validation: RCMs ERA40 simulations vs NASA

Representation of interannual variability

CLIM-RUN



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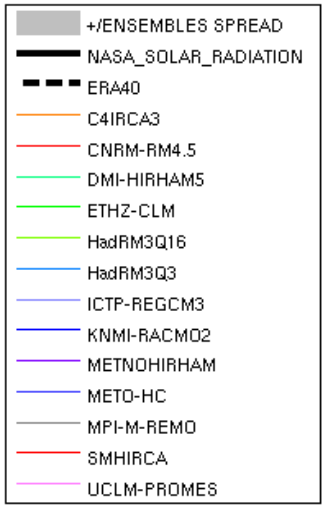

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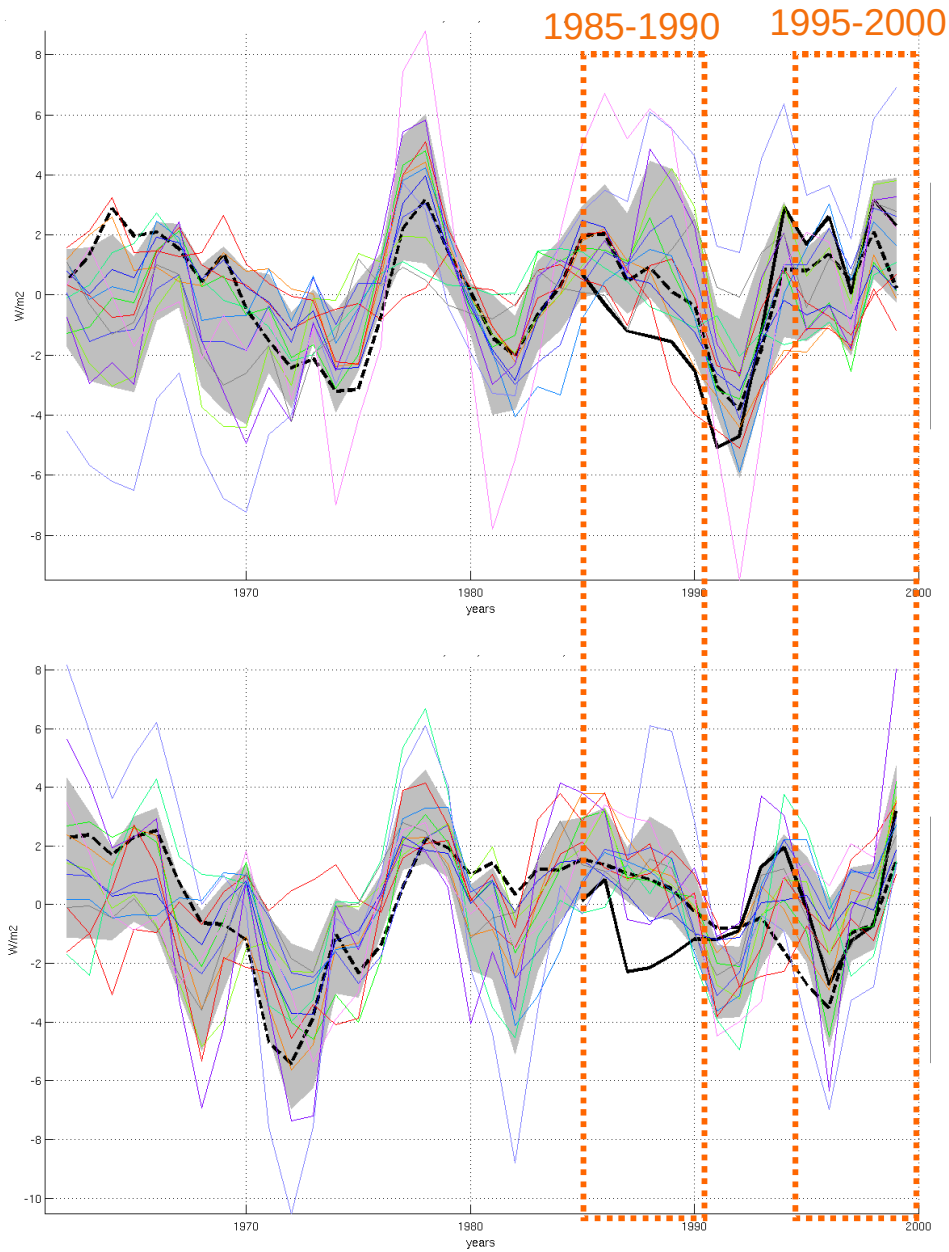

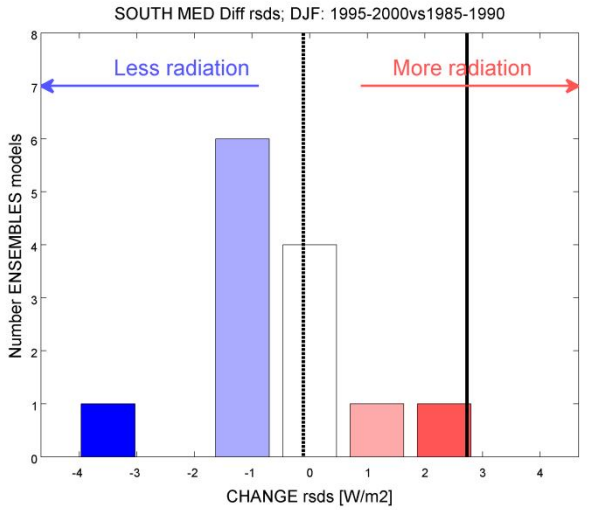

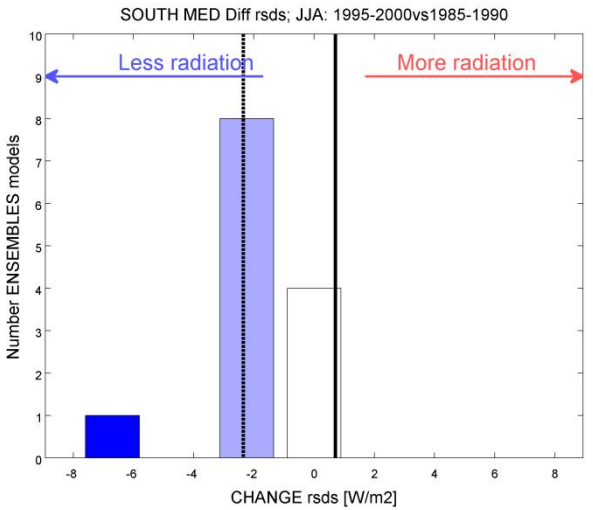

Conclusions

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Climate services for energy production: are regional climate models reliable for future solar power generation scenarios?

- **Looking forward for CORDEX (EURO & MED)**
- **Aerosols**
  - **Aerosols schemes, dynamics and chemistry**
  - **Aerosols primary and secondary effects**

<RCM dependent>

- **Clouds**
  - **Convection schemes**
  - **Microphysical parameterization**

<RCM dependent>

  - **Transport from the borders (nesting)**

<Large-scale drivers dependent>

NO

acknowledgment

Authors thank the support from the PV-Initative EFRE project and the FP7 CLIM-RUN project.

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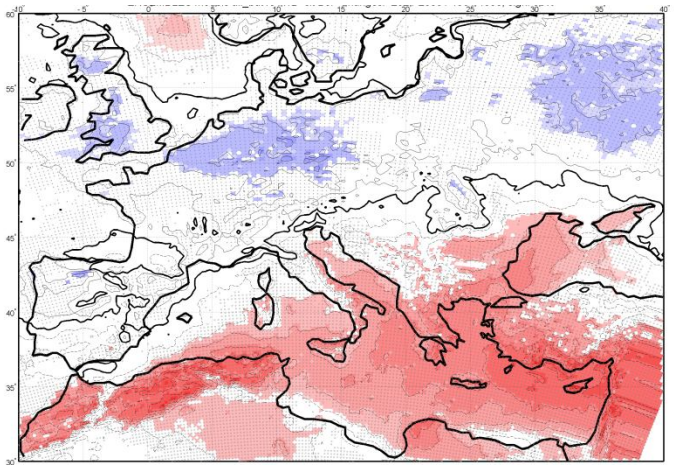
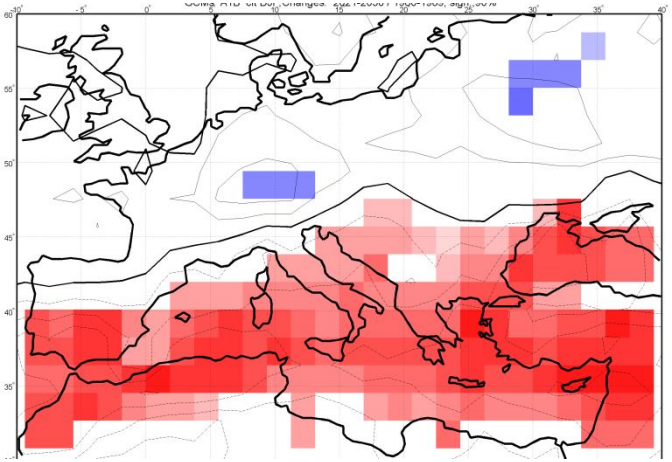
ENSEMBLES Scenario A1B

Cloud cover changes (2021-2050) vs (1961-1990)

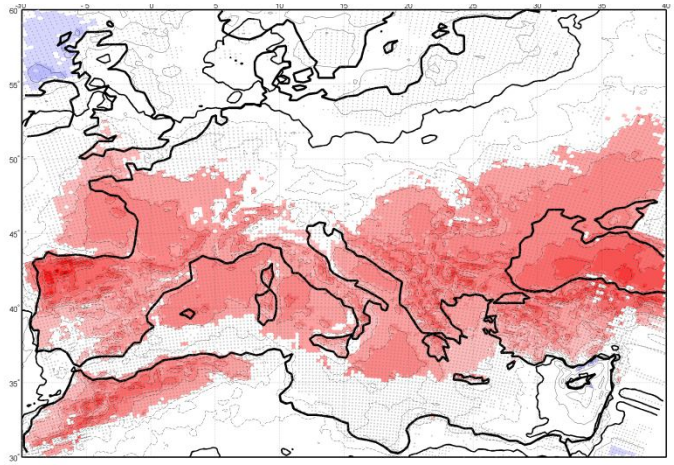
clt RCMs ENSEMBLES DJF



clt GCMs ENSEMBLES DJF



clt RCMs ENSEMBLES JJA



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