

CORDEX simulations at CNRM

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Picher, B. Decharme (J. Colin, M. Herrmann)

CORDEX: a coordinated international activity, under the WCRP umbrella that would develop a framework for:

i) the evaluation and intercomparison of regional downscaling models and methods as well as the definition of standards for the preparation and dissemination of model data, and

ii) the production of a multi-model ensemble of regional climate downscaling simulations for regions worldwide, which would significantly enhance the contribution of regional dynamical and statistical downscaling tools to future IPCC assessments.

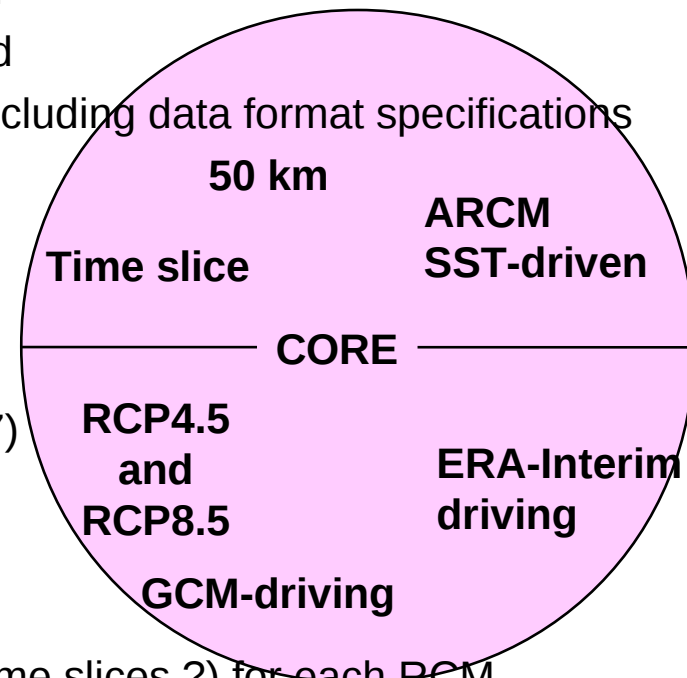
CORDEX

■ WCRP initiative for the Regional Climate Downscaling

- Led by F. Giorgi (ICTP) and C. Jones (SHMI)
- Endorsed by WCRP in Dec 2008 with the creation of the TFRCD (Task Force on Regional Climate Downscaling) + a suite of workshops: Toulouse (Feb. 2009), Lund (May 2009), Lille (June 2010), Trieste (Mar. 2011)
- Definition of several domains to be covered at 50 km
- Participation from modelling groups all over the world
- A general set of instructions for the CORDEX runs including data format specifications
- A web portal and central database archive at DMI
- A dedicated EGU session

■ CORE simulations

- Resolution: 50 km, Africa domain mandatory
- ERA-Interim lateral forcing for validation (1989-2007)
- Simulation: historical (1950-2005)
- Simulation: scenario RCP4.5 (2005-2100)
- Simulation: scenario RCP8.5 (2005-2100)
- One driving GCM and one transient simulation (or time slices ?) for each RCM
- Options: multiple GCMs for driving the RCD (uncertainty)
- Options: other domains

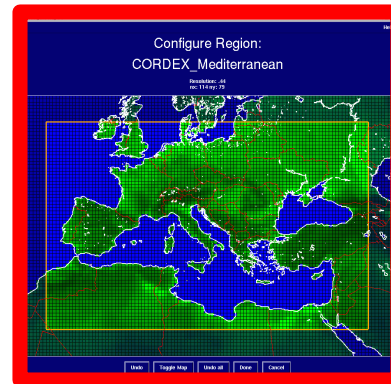
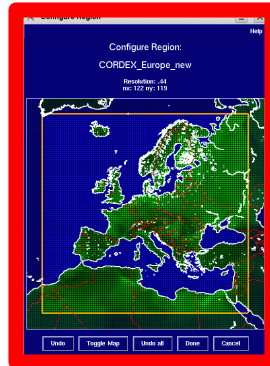
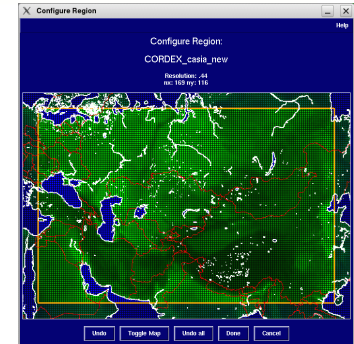
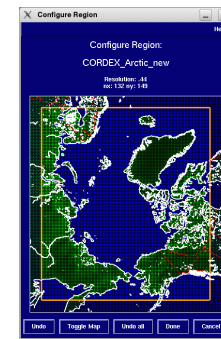


CORDEX: 12 domains at 0.44° or 50 km

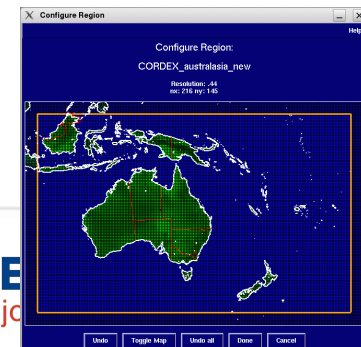
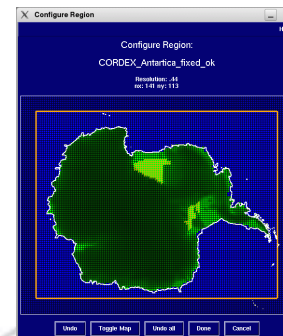
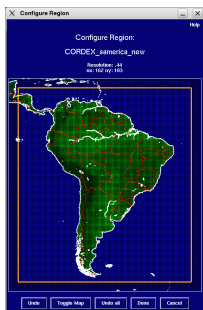
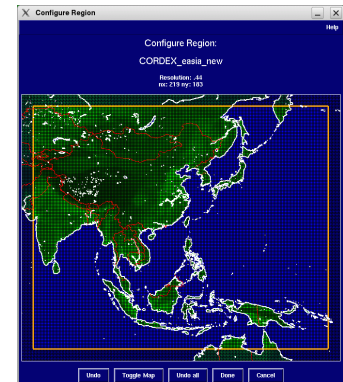
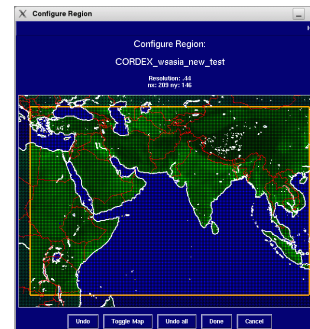
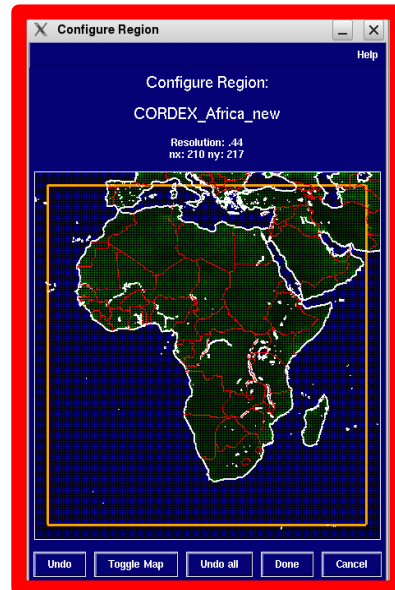
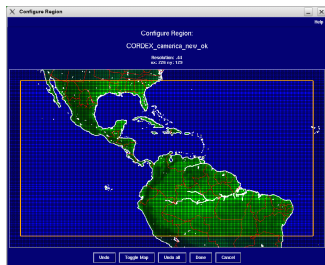
NARCCAP
OURANOS-UQAM

CORDEX@CNRM

PRUDENCE
ENSEMBLES
IMPACT2C



HyMeX-ChArMex-MerMex
MedCLIVAR
CIRCE
CLIMRUN



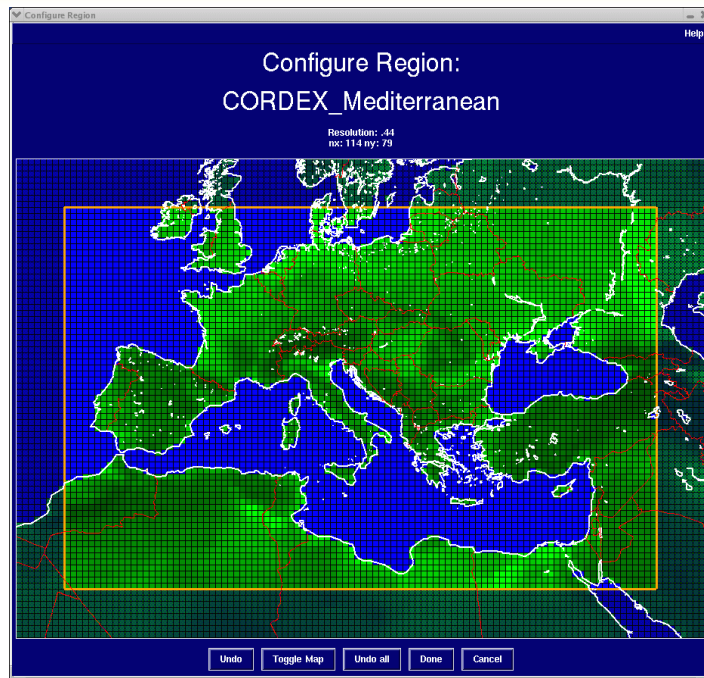
AMMA
ENSEMBLES

The Mediterranean domain in CORDEX:

Med-CORDEX

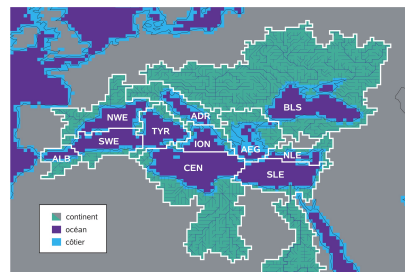
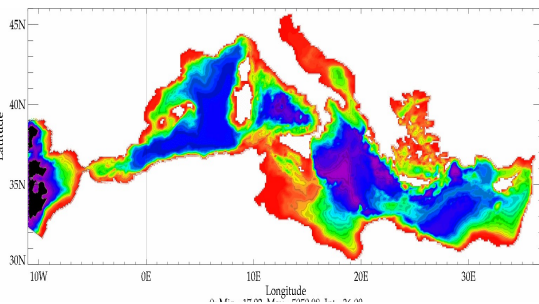
- Why do we propose a specific CORDEX Mediterranean sub-domain ?
 - Climate change hot-spot, very strong regional features
 - Need for high-resolution RCM (Gibelin and Déqué, 2003; Gao et al. 2006; Herrmann et al. 2011)
 - Need for air-sea-land-hydrology coupling (Somot et al. 2008; Artale et al. 2010)
 - Already-existing Mediterranean climate modelling community: MedCLIVAR, HyMeX, CIRCE
 - **RCSM: Regional Climate System Model (atmosphere, ocean, land surface, hydrology, river)**
 - **Very High resolution RCM (up to 10 km for the same domain)**
 - **Ocean model scenarios, Land surface model scenarios**
 - Specific design for the RCSM, land surf and ocean runs (task force in HyMeX)
 - Main goals: sharing good practices, enhance the communication between the various communities (ocean, atmo, land, hydrology), create new evaluation methods for the multi-component RCSM
 - Best use of the new satellite products and new in-situ dataset for model evaluation
 - Best use of the HyMeX synergy (in-situ field campaign, physical process community)
 - Work together to the improvement of the RCSM and of their components
 - Deliver quality-checked regional climate products to the climate community and the impact community
 - Deliver improved messages about the climate change in the Mediterranean area for the next IPCC report (IPCC-AR5)
 - hymex-ttm3@cnrm-meteo.fr P. Ruti (ENEA) S. Somot (CNRM) EOS paper

Med-CORDEX minimal domain

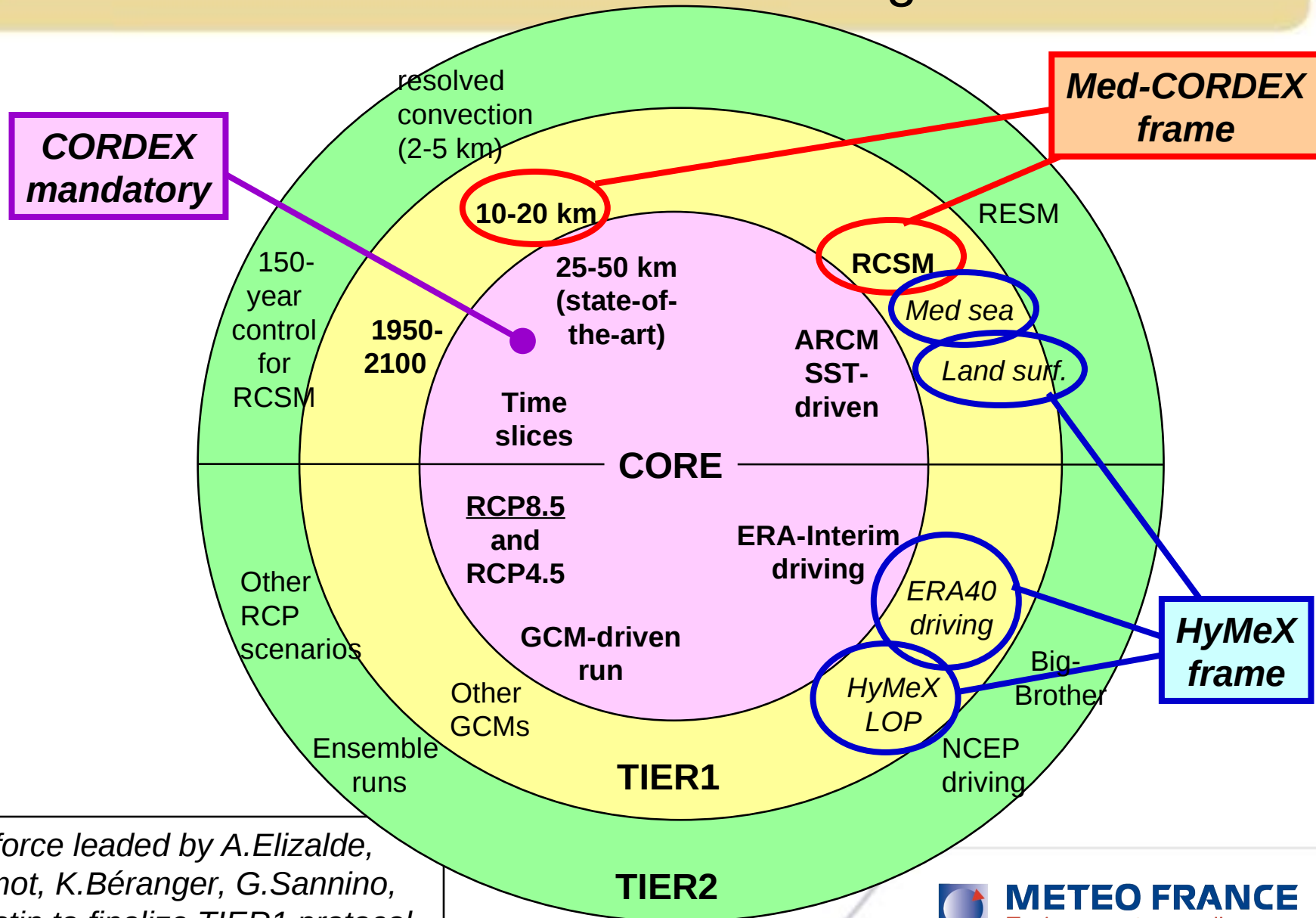


Definition:

- The domain covers the whole Mediterranean and Black Seas as well as their catchment basins plus the ocean model buffer zone
- It could be extended to cover the Sahara (aerosols), the near Atlantic (cyclones), the Middle-East



Med-CORDEX run design



Med-CORDEX modelling participant list



ENEA

MPI

CNRM

LMD

Univ. Belgrade

MORCE-MED

UCLM/UPM

COSMO-CLM (GUF)

INSTM

IC3

in development

atm-ocean-land-river

atm-ocean-land



Same ARCM as in RCSM (25-50km)

RegCM, ALADIN, WRF, ETA, LMD,
PROMES, REMO, COSMO-CLM

+ other ARCM (50 km)

TAU, IIBR, Univ. Istanbul (RegCM)

+ very high-resolution ARCM (10km)

WRF, ALADIN, RegCM, COSMO-CLM (KIT)

*Still open to
new “players”*



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Med-CORDEX scenario: the GCM/RCSM matrix

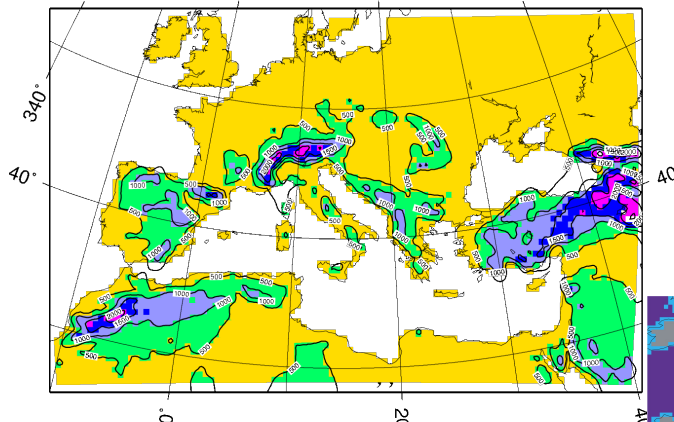
CIRCE - A1B

Med-CORDEX – RCP8.5 (RCP4.5)

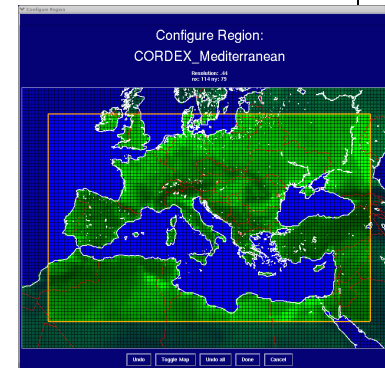
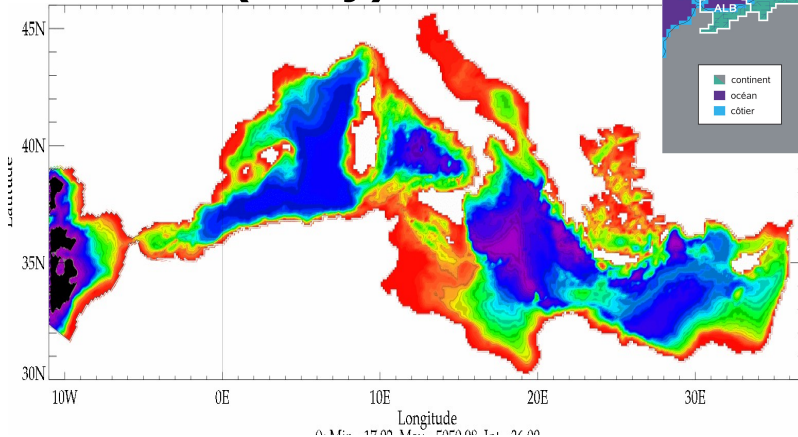
		RCM/GCM		GCM					
				CNRM	MPI	IPSL	INGV		
				RCM	ENEA	X	X		
				MPI				X	
Med-CORDEX – RCP8.5 (RCP4.5)				LMD			X		
		CNRM	MPI	IPSL	INGV	HadGEM	EC-Earth		
RCSM	ENEA	?	?						
	MPI		X						
	CNRM	X							
	LMD			X					
	U. Belgrade				X				
	MORCE-MED			X					
	UCLM/UPM					?			
COSMO-CLM			?						

The CNRM Regional Climate System Model (RCSM) including atmosphere-land surface-river-ocean

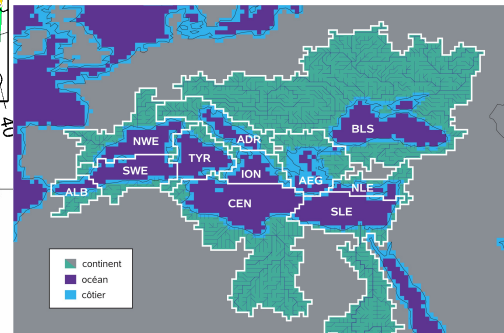
**ALADIN-Climat v5 + ISBA (ERA40,
ERAInterim, GCM forcing) 50 km**
(Déqué and Somot, 2008; Colin et al. 2010)



OASIS3 (daily)



Med-CORDEX
domain and
frame:
ERA-Interim
period (1989-
2008)

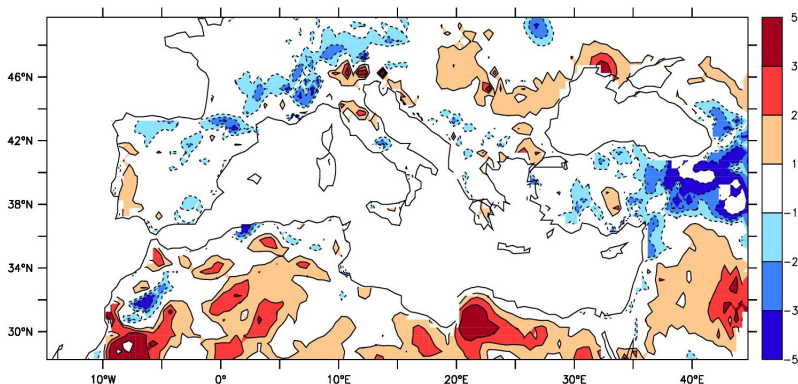


**TRIP river routine
scheme at 50 km**
(CNRM modified version,
Decharme et al. 2010)

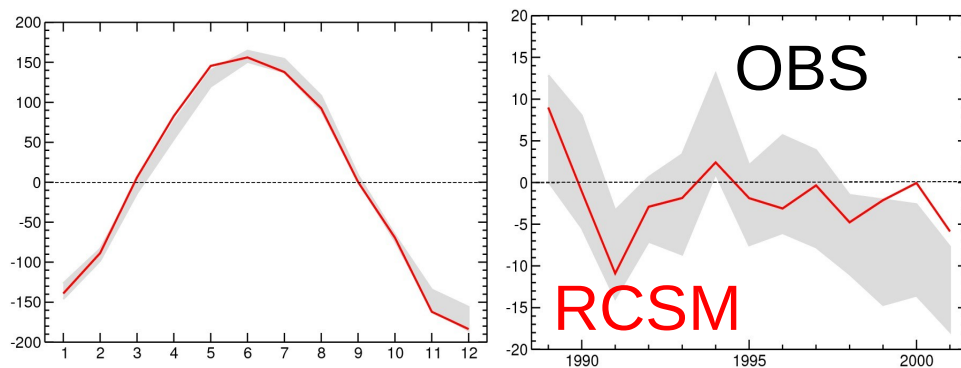
NEMOv2-MED8 (10 km)
(Sevault et al. 2009, Beuvier et
al. 2010, Herrmann et al. 2010)

Med-CORDEX ERA-Interim RCSM run at CNRM

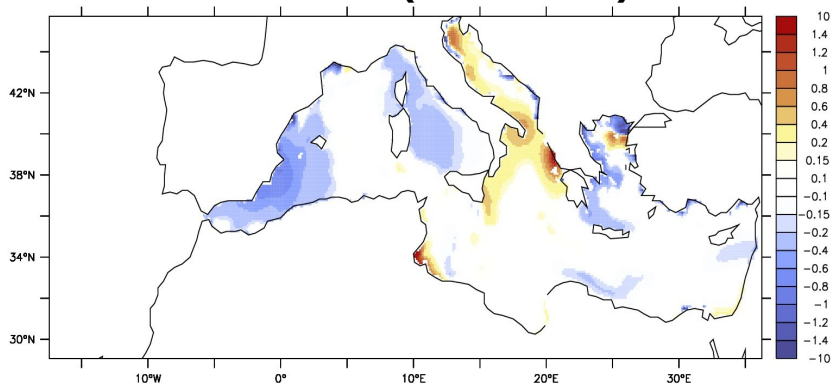
**2m Temperature bias wrt CRU (°C)
in Summer (JJA) 1980-2001**



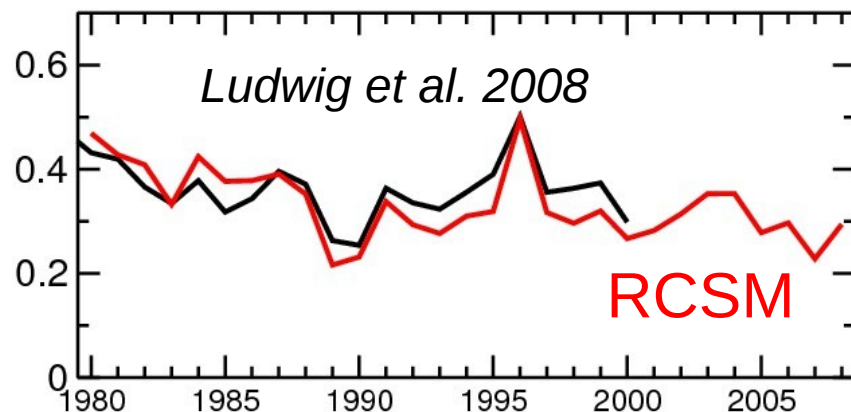
**Med Sea net surface Heat Budget:
SW+LW+LH+SH (W/m², 1989-2001)**



**SSS bias wrt MedAtlas-II (psu)
in Winter (1989-2008)**

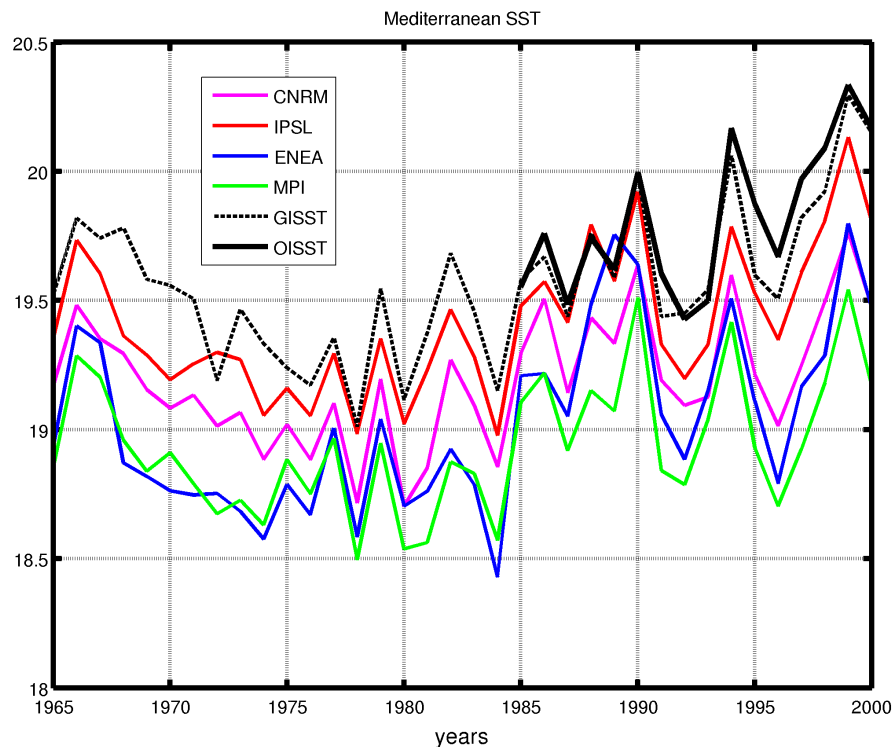


Mediterranean Sea river flux (mm/d)



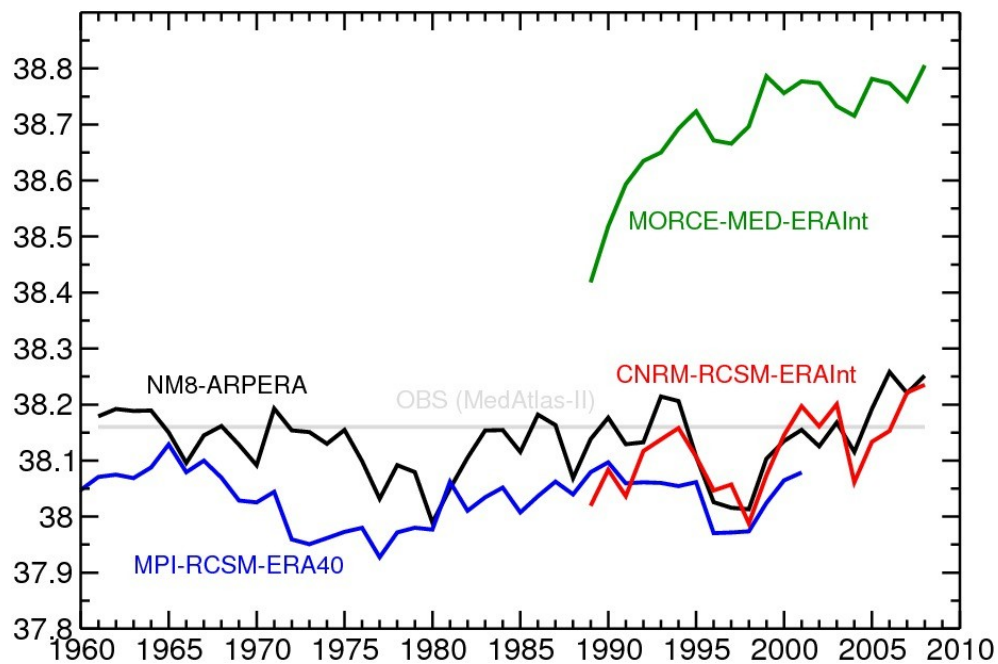
First Med-CORDEX intercomparison

SST interannual time series RCSM driven by ERA40, 1965-2000



*Li et al. (2011), MedCLIVAR book,
Chap. 7 (figure made by P. Ruti)*

SST interannual time series RCSM driven by ERA40, 1965-2000



*Ruti et al. (in prep.), MedCORDEX ,
(figure made by C. Dubois)*



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Conclusion: CORDEX at CNRM

- ALADIN-Climat, version 5 (Colin et al. 2010; Herrmann et al. 2011)
- Configuration: 50km and 12km resolution, ARCM and RCSM
- Domain: Africa, North America, Mediterranean (CNRM)
- Domain: Europe (50km: Hungarian met service; 10km: CHMI)
- Open to scientific collaborations for other domains
- ERAInterim runs (1989-2008): first runs ok for Africa (50km), North America (50km), Mediterranean (50km, 12km, RCSM).
- RCP driven runs: ready to be launched
- MedCORDEX (official domain in CORDEX):

CNRM shares the co-leadership with ENEA

more than 10 modelling centers (ARCM, RCSM and 10km runs), regular meetings, a Med-CORDEX database at ENEA, first ERAInterim runs ok, a dedicated evaluation team, synergy Med-CLIVAR/Med-CORDEX/HyMeX, first EOS paper (Ruti et al., in prep.), no coordinated SDS effort in Med-CORDEX yet

