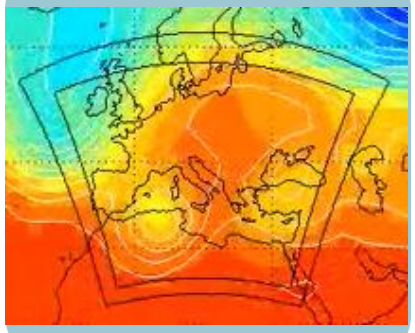
Climate science towards

actionable information

facing Societal needs



Thanks to:
S Somot (CNRM)
A Dell' Aquila (ENEA)

PM Ruti

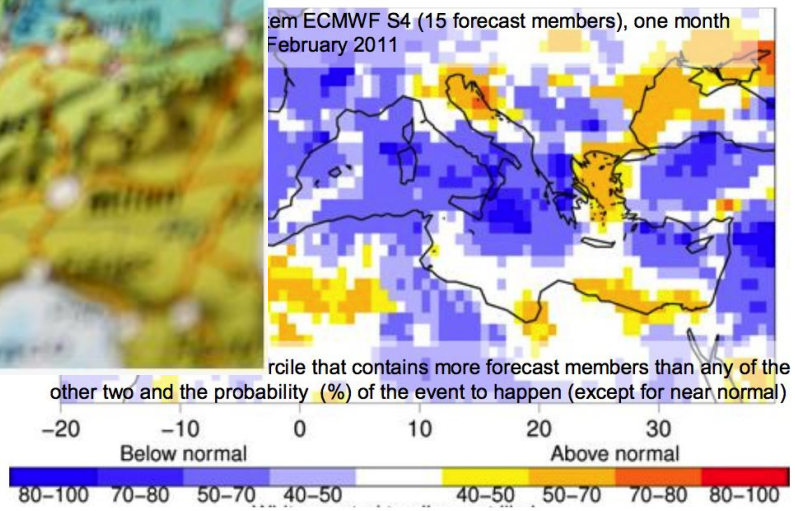
ENEA

Challenges of climate services

- A short story
- Research on climate services
- MedCORDEX: data 4 impacts

A typical question – Planning wind-farms

An estimation of local wind conditions is especially crucial in the selection of the site. If the wind speeds are 10% smaller than expected, the energy yield will fall short by more than 30%, which can quickly cause economic problems



Common points

- Stakeholders (policy-makers, industry etc) have relevant questions for climate science.

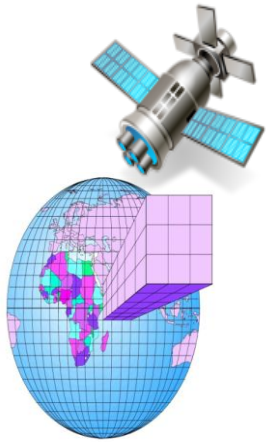
- Local and regional climate information

- Present climate and near future (6m to 10y)

Climate Services definition

Information

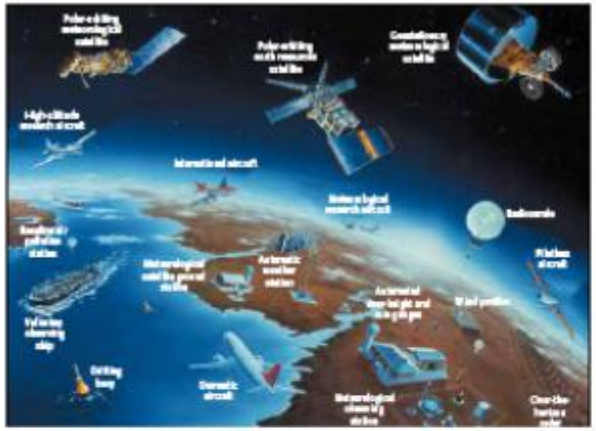
Climate Data



Fill the Last Mile gap between large amount of climate data and user needs

Users needs

Starting point: WCC3 2009



Enable better management of the risks of climate variability and change and adaptation to climate change, through the development and incorporation of **science-based** climate information and prediction into planning, policy and practice on the global, regional and national scale

GFCS

The first EU research project

www.climrun.eu

What is CLIM-RUN?

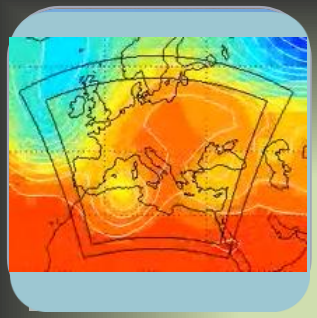
CLIM-RUN Case studies

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.)*

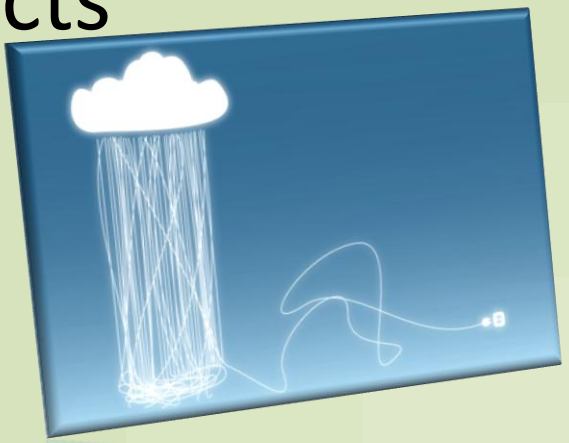
Integrated Case Study: North Adriatic

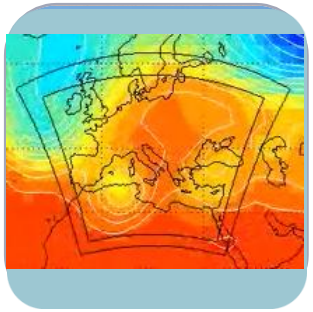


Challenges of climate services

- A short story
- Research on climate services

MedCORDEX: data 4 impacts

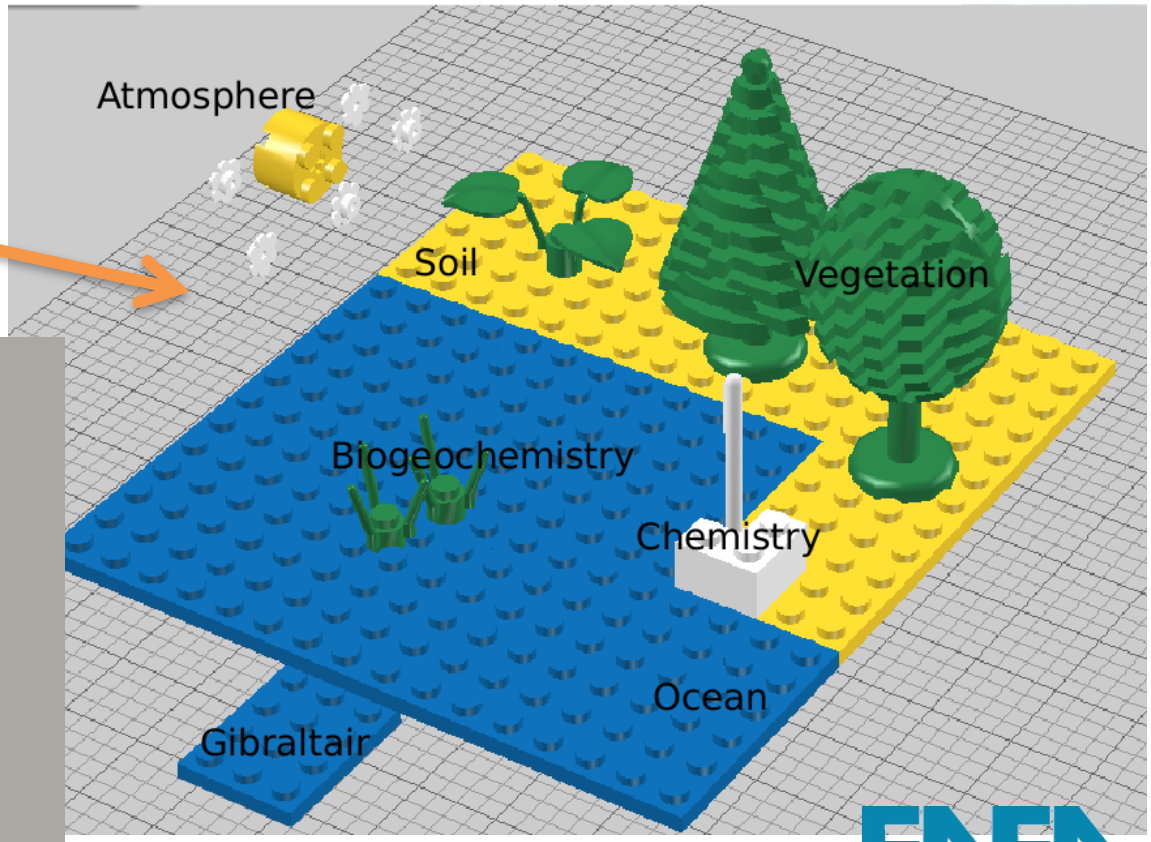




Weather prediction and climate simulations

The short-term to seasonal prediction and the simulation of the climate change need to define the different components of the climate syste:

- atmosphere
- land surface
- hydrosphere
- cryosphere



The Primitive Equations

$$\frac{du}{dt} - \left(f + \frac{u\tan\phi}{a}\right)v + \frac{1}{\rho}\frac{\partial p}{\partial x} + F_x = 0$$

$$\frac{dv}{dt} + \left(f + \frac{u\tan\phi}{a}\right)u + \frac{1}{\rho}\frac{\partial p}{\partial y} + F_y = 0$$

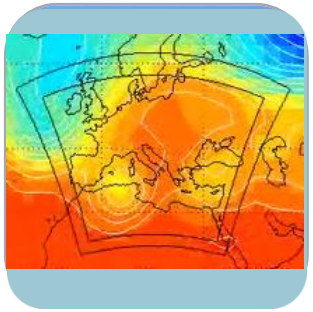
$$p = R\rho T$$

$$\frac{\partial p}{\partial z} + g\rho = 0$$

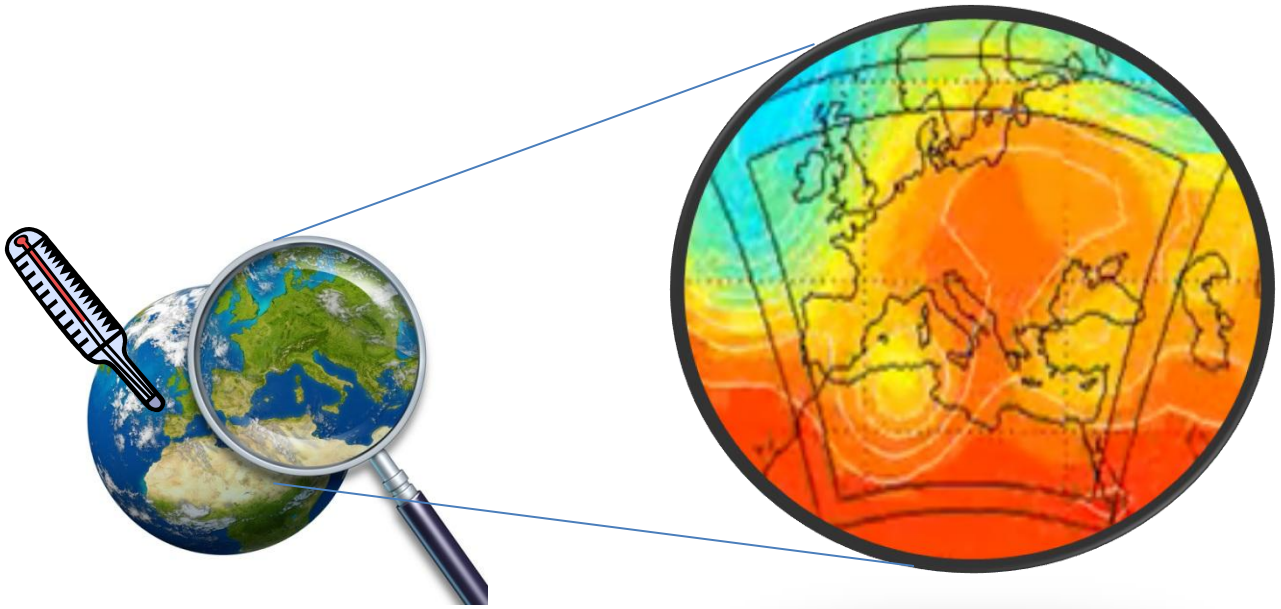
$$\frac{dT}{dt} + (\gamma - 1)T\nabla\cdot\mathbf{V} = \frac{Q}{c_p}$$

$$\frac{\partial \rho}{\partial t} + \nabla\cdot\rho\mathbf{V} = 0$$

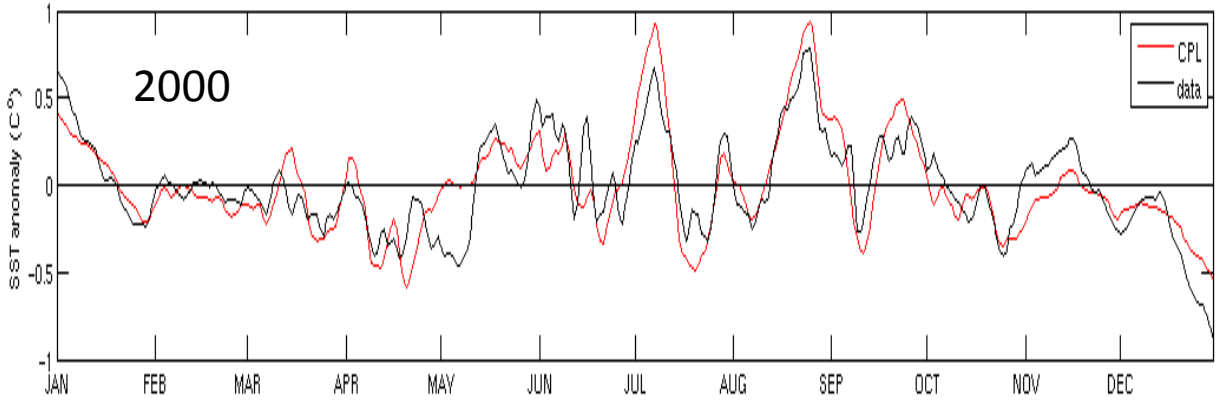
$$\frac{\partial \rho_w}{\partial t} + \nabla\cdot\rho_w\mathbf{V} = [\text{Sources} - \text{Sinks}]$$

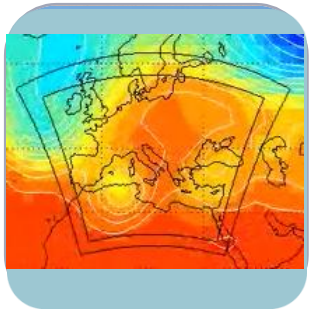


Climate information at regional scale

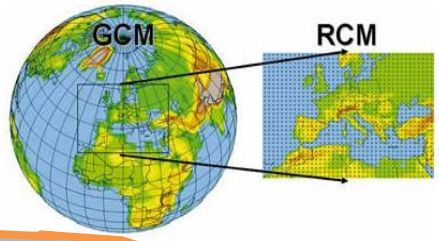


Regional modeling able to reconstruct present climate variability and Extremes .... Here a coparison between obs and modeled SST after 40 years of coupled simulation



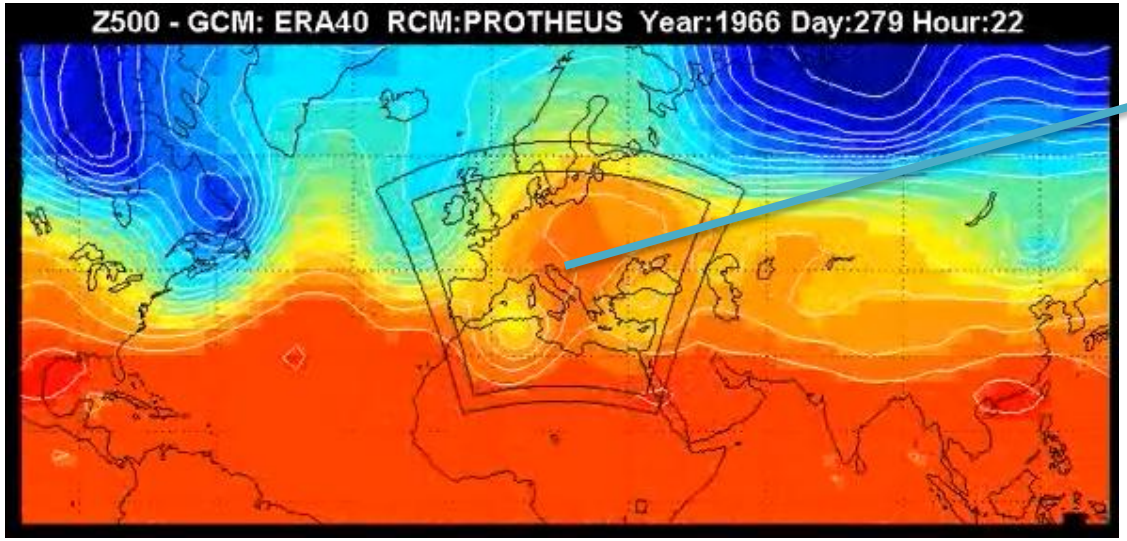


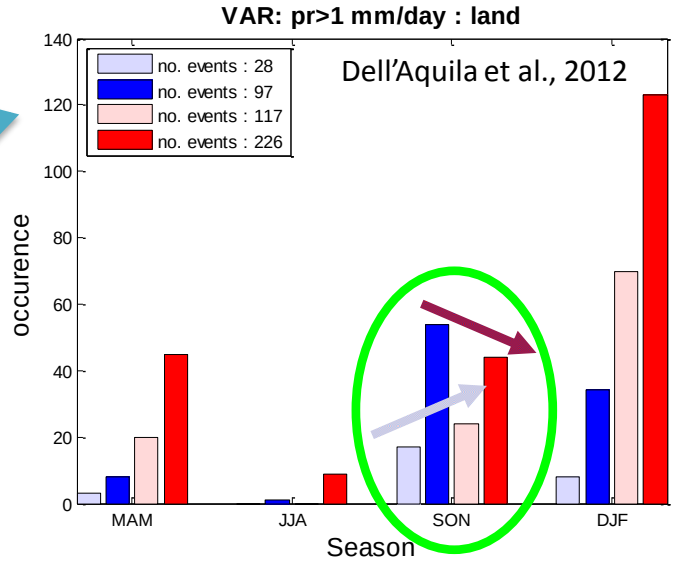
Climate projections at regional scale

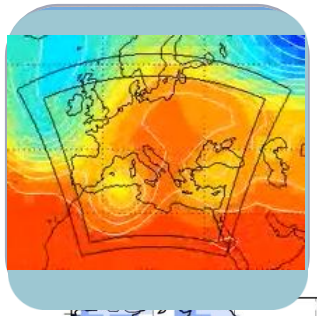


Future climate

Present climate

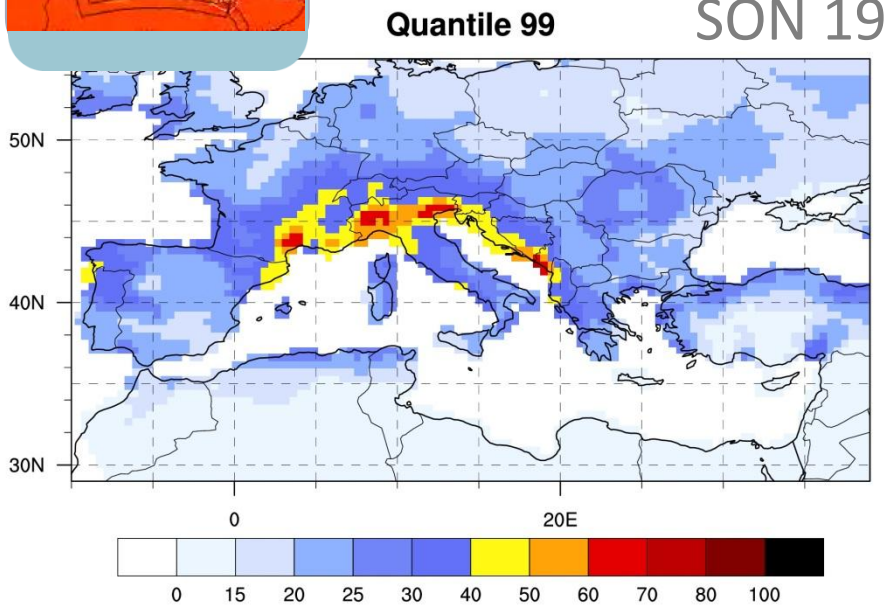


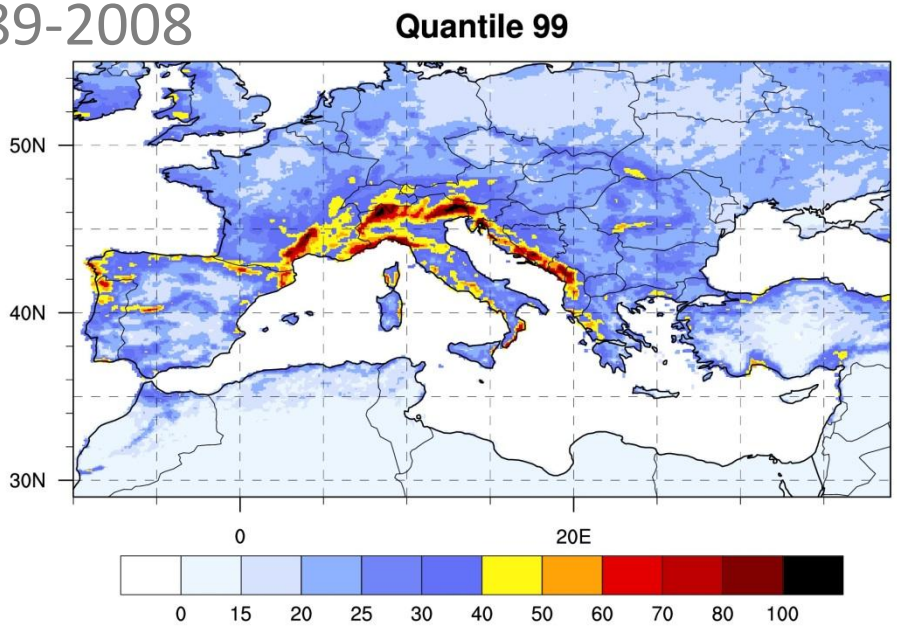




Rainfall extremes

SON 1989-2008

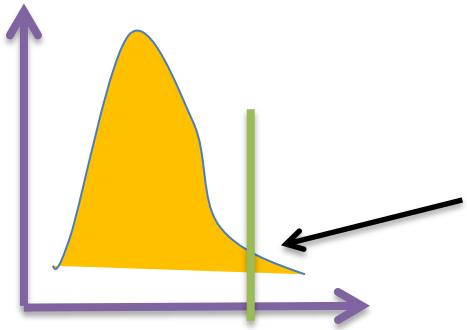


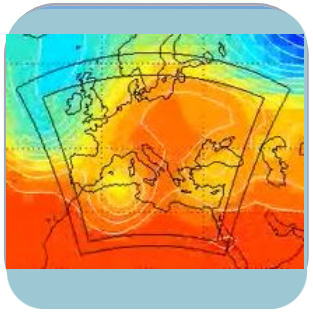


RCM 50 km

Do the resolution matter?

RCM 12 km





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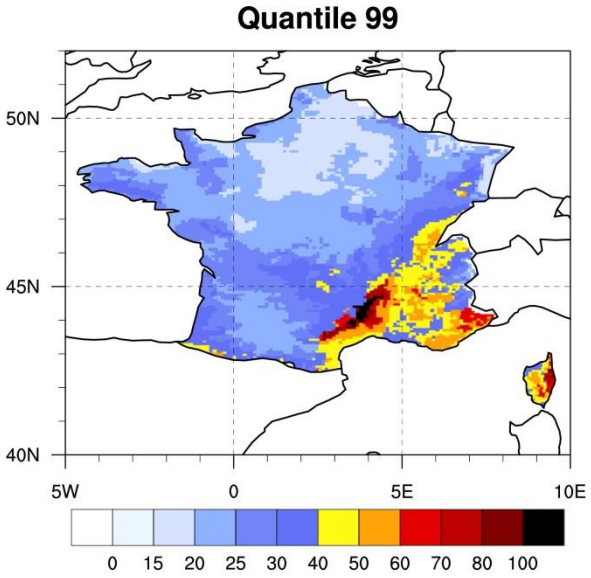
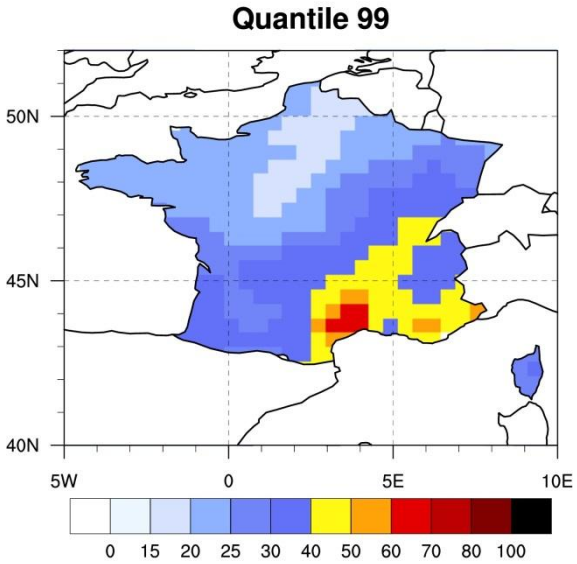
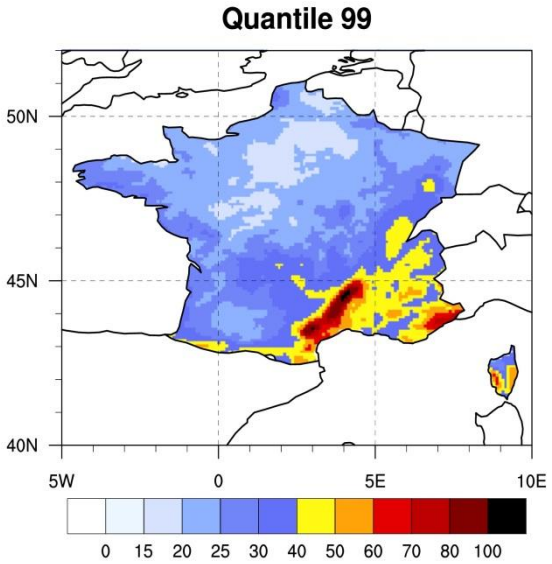


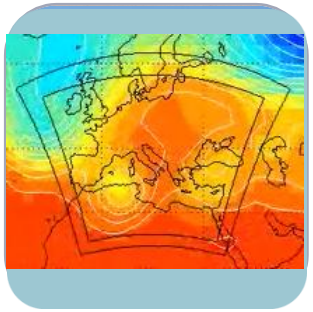
Obs Safran



RCM 50 km

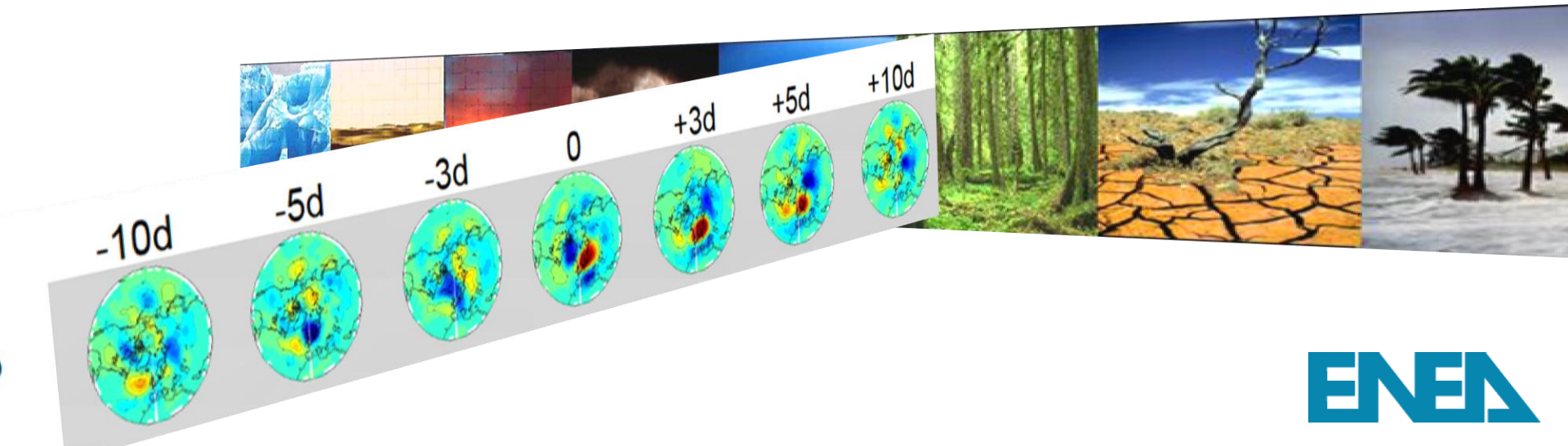


RCM 12 km



Climate services: few ingredients

- Modeling skills especially at regional scale
- A better understanding of climate processes
- A multi-disciplinary approach



Challenges of climate services

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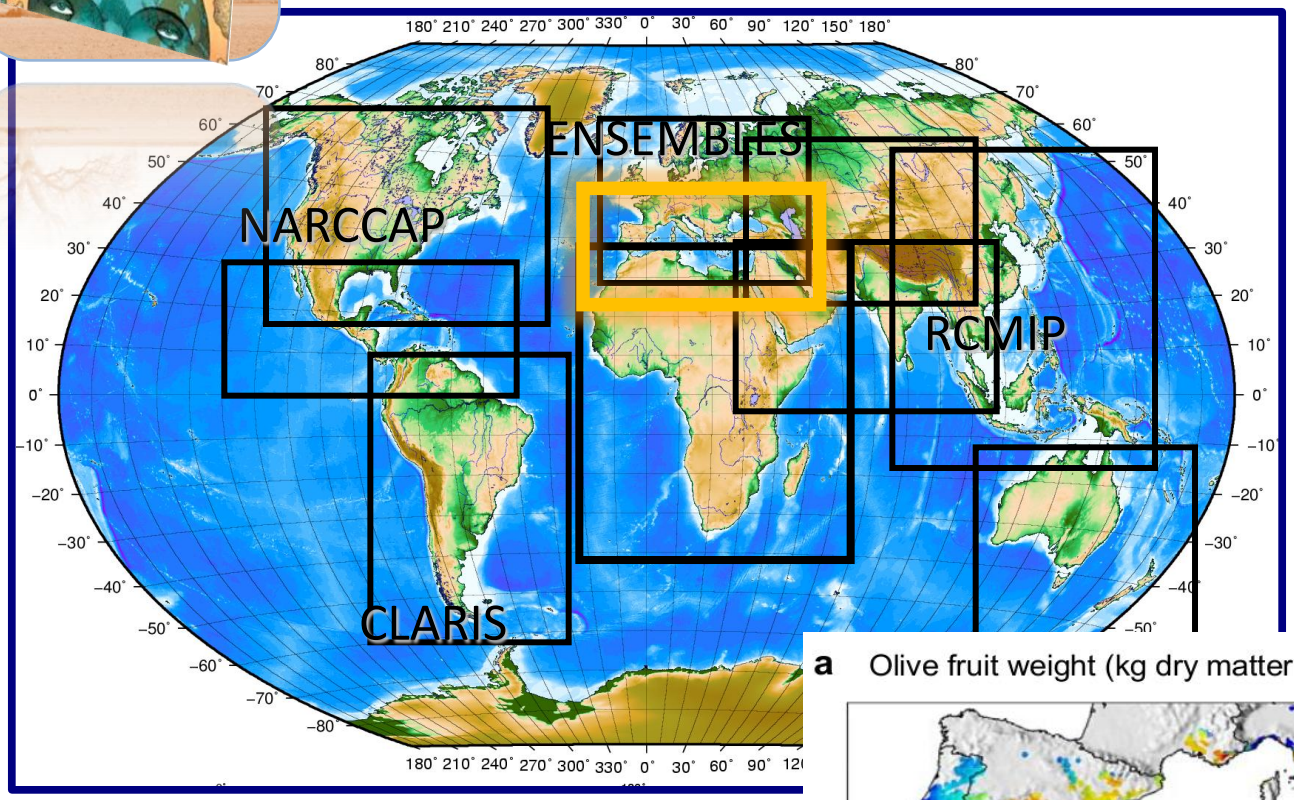
- MedCORDEX: data 4 impacts

CORDEX project

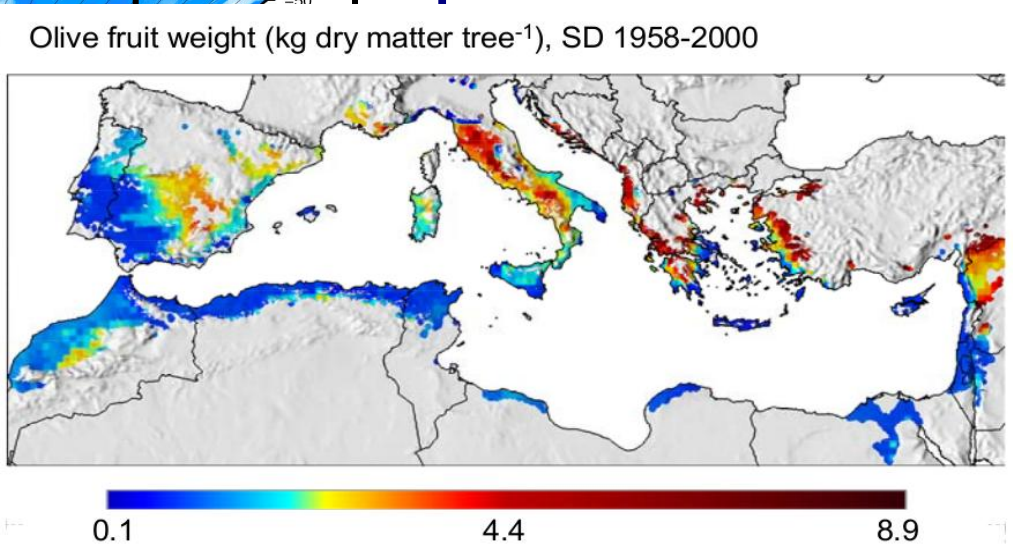
Giorgi, WMO Bulletin 2009



CORDEX will develop regional downscaling scenario and it will increase the link with stakeholders and impact studies

Med-CORDEX will be developed within the HyMeX Framework

MED CORDEX
COordinated Regional Downscaling Experiment



MedCORDEX

Further understanding of the feedbacks between earth system components at regional scale (chemistry, land-surface, ocean etc)

Further understanding of the processes acting at the air-sea interface

Characterization and analysis of all components of the regional hydrological cycle

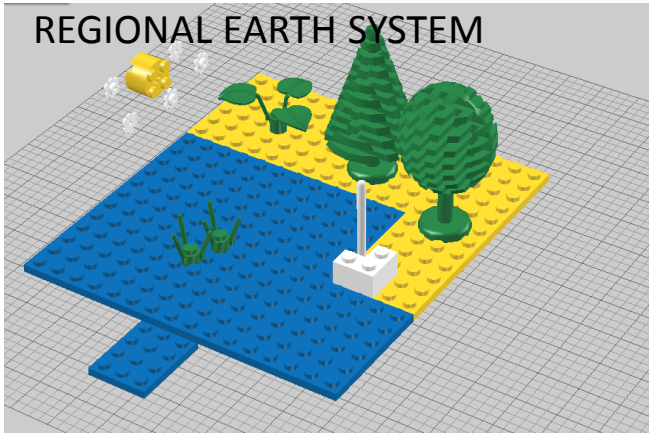
Provisions of new sets of scenarios for the Mediterranean basin (AR5)

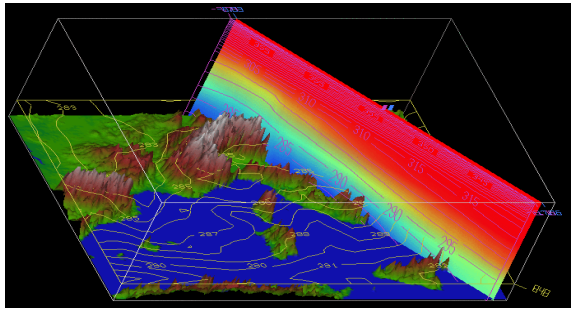
Regional coupled models - AORCM (CIRCE)

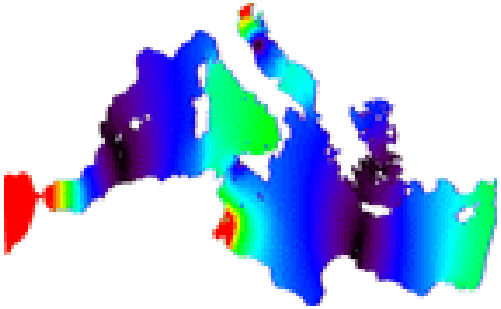
ARCM – ORCM - Rivers

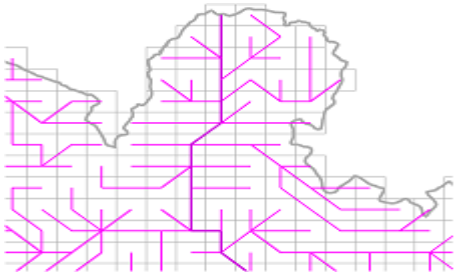
High resolution ARCM → non-hydrostasy

RESM









MedCORDEX – Portal

www.medcordex.eu

WCRP CORDEX | MedCLIVAR | HyMeX – HYdrological cycle in Mediterranean EXperiment

Med-CORDEX

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MEDCORDEX data base

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HYMEX data base

models

Med-CORDEX participating teams and models

Today, Med-CORDEX gathers 20 different modelling groups from 9 different countries (France, Italy, Spain, Serbia, Turkey, Israel, Tunisia, Germany, Hungary) in Europe, Middle-East and North-Africa. It includes 9 atmosphere RCMs, 8 regional ocean models and 12 Regional Climate System Models. Evaluation runs use the ERA-Interim reanalysis as lateral boundary conditions. Historical and scenario runs use 6 different GCMs from CMIP5.

The community meets regularly during dedicated international workshops (Toulouse Sept 2009, Toulouse March 2012), at EGU every year or during the HyMeX annual workshops (Bologna 2010, Menorca 2011, Primosten 2012). The last MedCORDEX meeting sponsored by the INSU-MISTRALS program in Toulouse was held in March 2012 during 3 days and gathers 50 persons.

List of the registered modelling groups: *ENEA, CNRM, LMD, MPI, IPSL, Univ. Belgrade, UCLM, UPM, INSTM, KIT, GUF, UAH, IC3, CMCC, ENSTA, MERCATOR, TAU, ITU, IIBR, Eotvos Lorand U*

List of the participating models:
9 Atmosphere-only 50-25 km RCM: *RegCM3, RegCM4, ALADIN, REMO, LMDZ, EBU, WRF, COSMO-CLM, PROMES*
4 Atmosphere-only 10-20 km RCM: *RegCM4, ALADIN, WRF, COSMO-CLM*
8 Ocean-only regional models: *MITgcm, NEMOMED8, MPIOM, NEMOMED12, MOSLEF, POM, INSTM-MED, NEMO-MFS*
12 Fully coupled RCSM (at least ocean-atmosphere): *ENEA, MPI, CNRM, LMD, Univ. Belgrade, MORCE-MED, UCLM/UPM, INSTM, COSMO-CLM, UAH, IC3, CMCC*

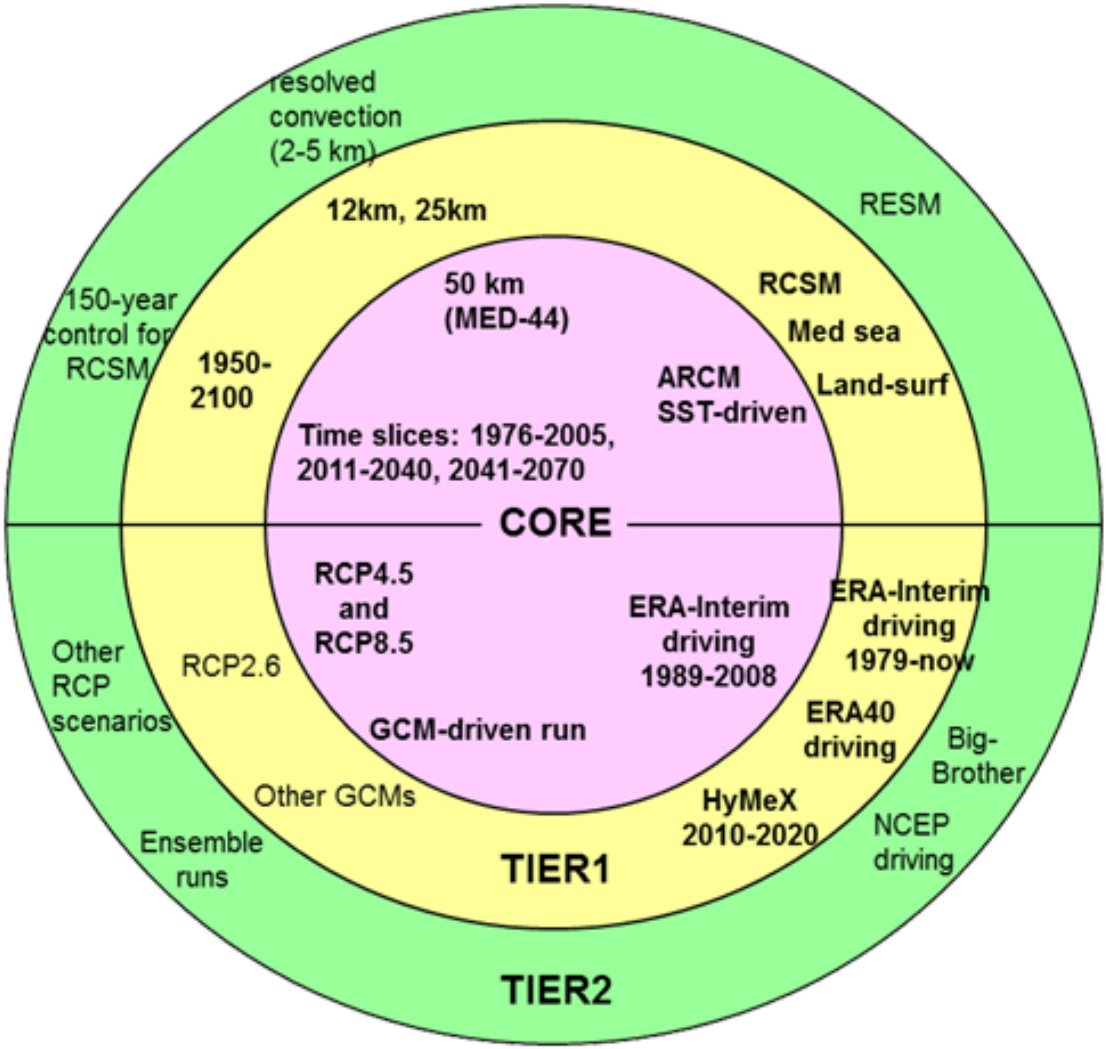
List if the GCM used for the scenario runs: *CNRM-CM5, IPSL-CM5, HadGEM, MPI, CMCC, EC-Earth* (at least two RCM runs per GCM are planned)

List of the participants also called the Med-CORDEX modelling team: *Ahrens B, Alias A, Arsouze T, Aznar R, Bartholy J, Bastin S, Béranger K, Beuvier J., Brauch J, Cabos W., Calmanti S, Calvet J-C, Carillo A, Decharme B, Dée;qué M., Dell'Aquila A, Djurdjevic V, Drobinski P, Dubois C, Elizalde-Arellano A, Gaertner M, Galàn P, Gallardo C, Giorgi F, Gualdi S, Harzallah A, Herrmann M, Jacob D, G. JordÃ , Khodayar S, Krichak S, Lebeaupin-Brossier C, L'Heveder B, Li L, Liguori G, Lionello P, Onol B, Planton S, Raikovic B, Rostkier-Edelstein D, Ruti P, Sannino G, Sevault F, Somot S*

Evaluation team: The Med-CORDEX evaluation team is based on the MedCORDEX modelling team and on the HyMeX TTM3d group.

MedCORDEX – Portal

www.medcordex.eu



Impacts on the tourism sector

°C	T_{min}	T_{mean}	T_{max}
2021 -2050	1.1	2.3	3.7
2071 -2100	3.8	6.0	7.7

CLIM-RUN