

# Application of climate services at the regional and sub-regional scale

## Some lessons from the CLIM-RUN and DRIAS projects

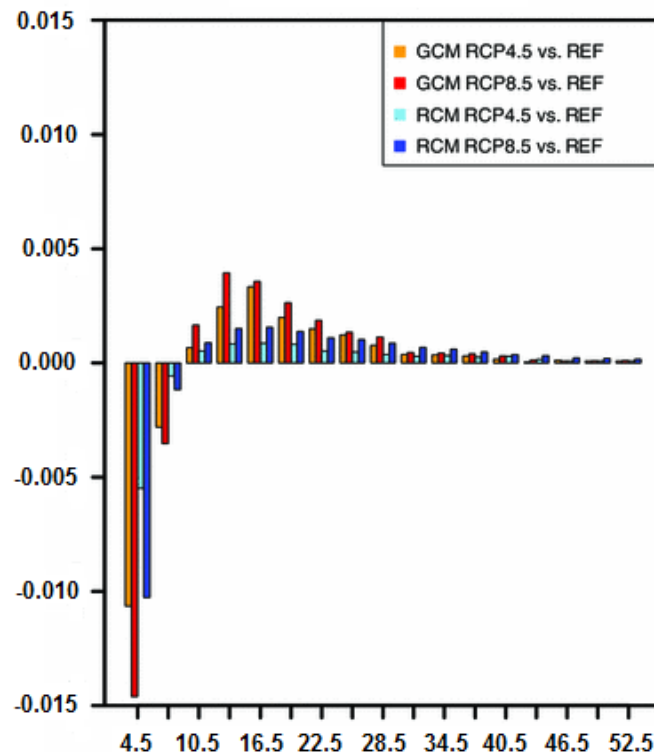
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With inputs from Paolo Ruti (WMO)  
and Samuel Somot (Météo-France, CNRM/GAME)

# Added-value of regional downscaling

« ... there is high confidence that downscaling adds value both in regions with highly variable topography and for various small-scale phenomena »  
(IPCC, 2013)

Temporal changes of the precipitation frequencies between 2021–2050 and 1971–2000 for RCP4.5 and RCP8.5 in Euro-CORDEX (Jacob et al., 2014)



Different climate responses between GCMs and RCMs

# Main Goals of

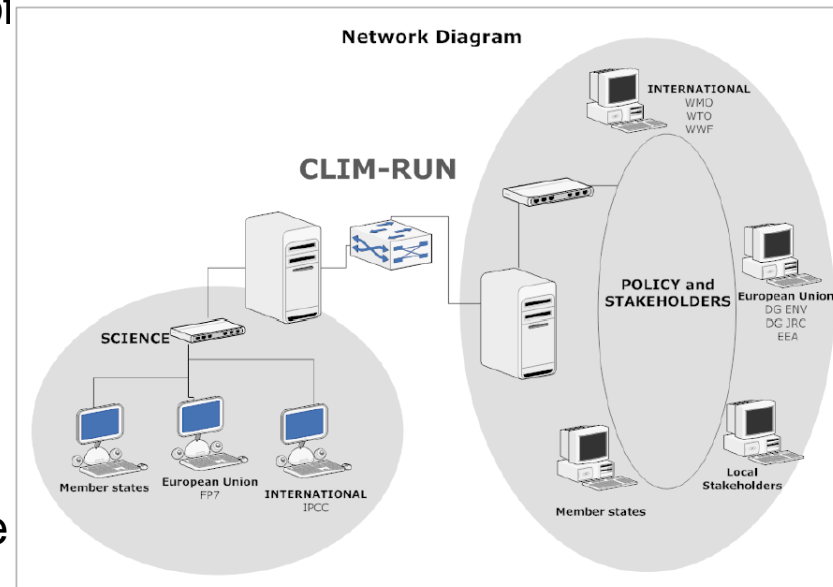


- Design and implementation of a **protocol** for optimizing the **two-way information transfer** (bottom-up /up-bottom) between climate experts and stakeholders
- Advancement of the **science underpinning** the production of detailed **climate information** at regional to local scales tailored for **stakeholder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

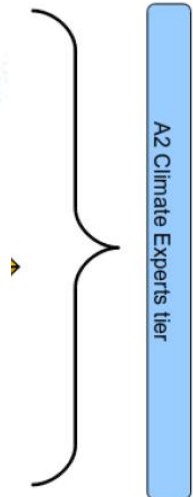
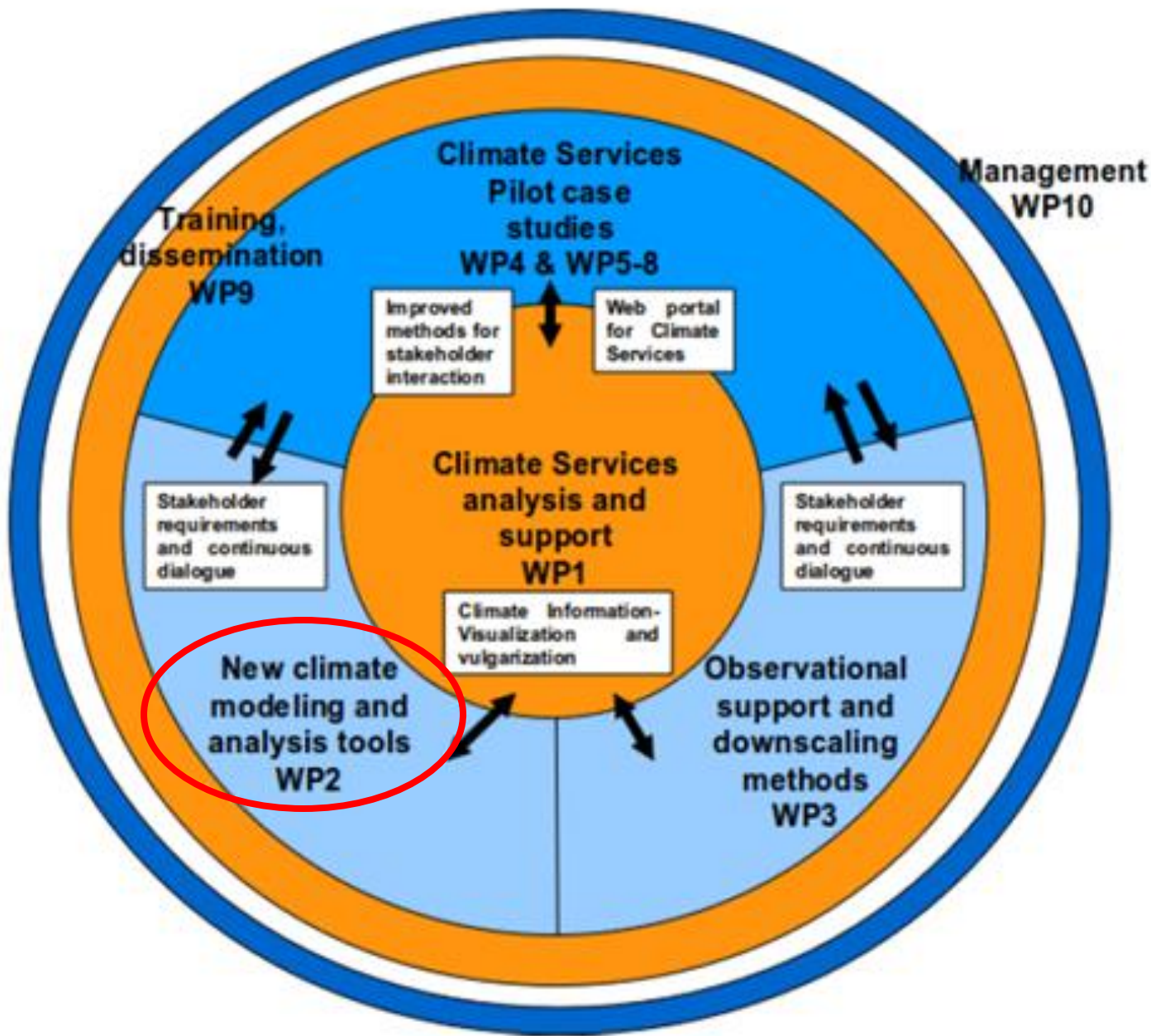
CLIM-RUN will bring progress beyond the state of the art in two main respects:

-Underpinning science to produce local scale climate information at decadal and longer time scales, and characterization of related uncertainties

- Bottom-up climate service protocol and strengthening of the interactions between climate experts and stakeholders



Courtesy: Paolo Ruti



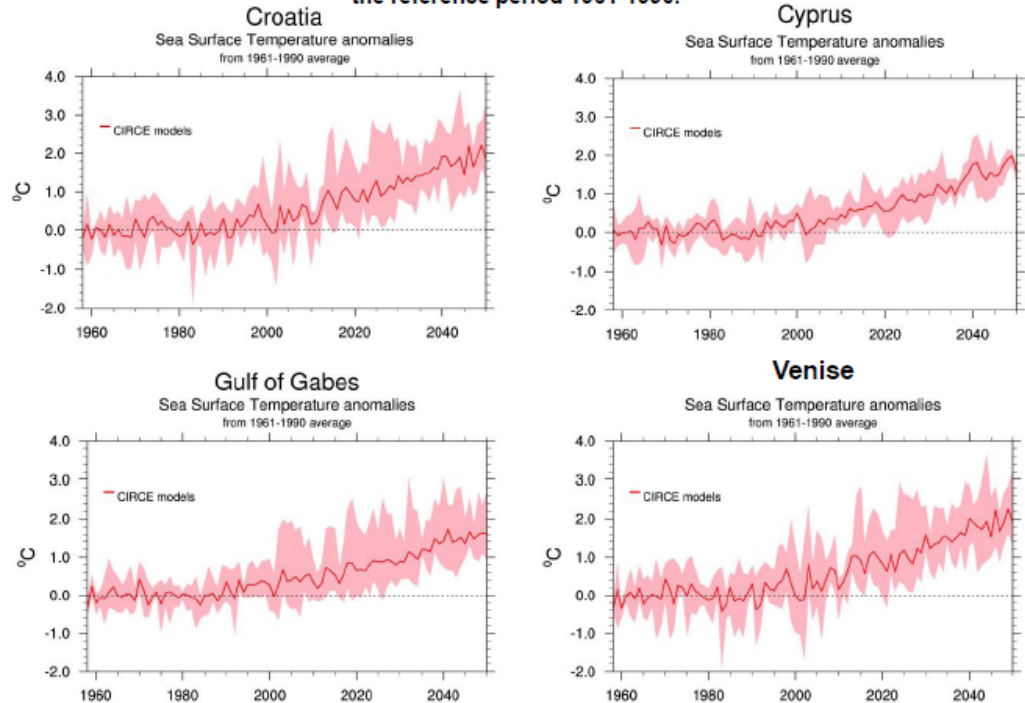
- Tourism
- Energy
- Coasta

## Sea Surface Temperature in Coastal Regions

# Some lessons

- Certification of climate tool
  - Very good existing climate information (thanks to previous work COMBINE) and international cooperation
  - The CORDEX was too large
- Provision of tailored climate information
  - Production of 22 information products using a multi-model approach
  - Lack of local observed data for validation and adaptation
- Performing new research
  - New RCM development, aerosols modelling, Regional climate service requirements
  - Difficulty to match the local climate service requirements

Projections of the yearly sst at the different sites over the middle of the 21st century compare to the reference period 1961-1990.



### Making the Product Usable

We are aware that the products delivered here may underestimate the uncertainty due to the use of only five AORCMs and one emission scenario. Especially these simulations were the first realized with AORCMs over the Mediterranean sea. However we think that the new generation of high resolution AORCMs will give more reliable results to better answer the projection of the SST in more complex bathymetry of the Mediterranean sea. In the near future, new simulations coming from the MED-CORDEX project will be used. More climate models are carrying out high resolution climate simulations over the 21st century under different emissions scenarios. These new simulations will cover a larger ensemble of uncertainties for future climate change. In the future, observations timeseries could be collected or retrieved at those sites and a statistical correction can be applied. This could also help us to calculate a bathing index.

From stakeholders, this product gives the effects of climate change on the SST at different locations. It could be coupled to a detailed analysis of the impacts on water quality in order to collect opportunities and threats in the far future for bathing activities.

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Further information : [www.climrun.eu](http://www.climrun.eu)

# Drias: Access to French Regional Climate data and products for Impact and Adaptation: [www.drias-climat.fr](http://www.drias-climat.fr)

**Drias**<sup>Futures of climate</sup>, climate projections for adaptation of our societies.

**Drias**<sup>Futures of climate</sup> aims to provide regionalized climate projections computed by several French laboratories involved in climate modeling (IPSL, CERFACS, CNRM-GAME). Climate informations are delivered in a variety of graphical or numerical forms.

**Drias**<sup>Futures of climate</sup> offers a process of appropriation in three steps: **Education Space** shows an user guide and best practices for climate projections. **Discover Space** allows to view and **locate geographically** "nearest you" climate projections, in **France** and **Overseas**: you can get all the informations provided by the different climate models for the **most recent scenarii** which are showed in the **last IPCC report (RCP)**. Finally in **Data and Products Space**, you can download all these parameters and climate indices as numerical data.

**News ...**

[23/09/14]  
The Climate of France in the 21st century (V4)

[06/08/14]  
RCP Scenarios Integration

**AREA Education**  
The user and good practice guide for Data and Products Drias<sup>Futures of climate</sup>.

**AREA Discover**  
Exploratory paths of climate projections: temperature, precipitation, models, IPCC scenarios.

**AREA Data and Products**  
Data and products Drias<sup>Futures of climate</sup>

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# Accompanying expertise reports « mission Jouzel »

- **4<sup>th</sup> volume** published in conjunction with a new data release through the DRIAS portal (September 2014)

- To account for new regional climate simulations over France based on the RCP scenarios
- To account for the extension of the simulations to overseas territories.
- To account for a new representation of uncertainties based on Euro-cordex simulations.

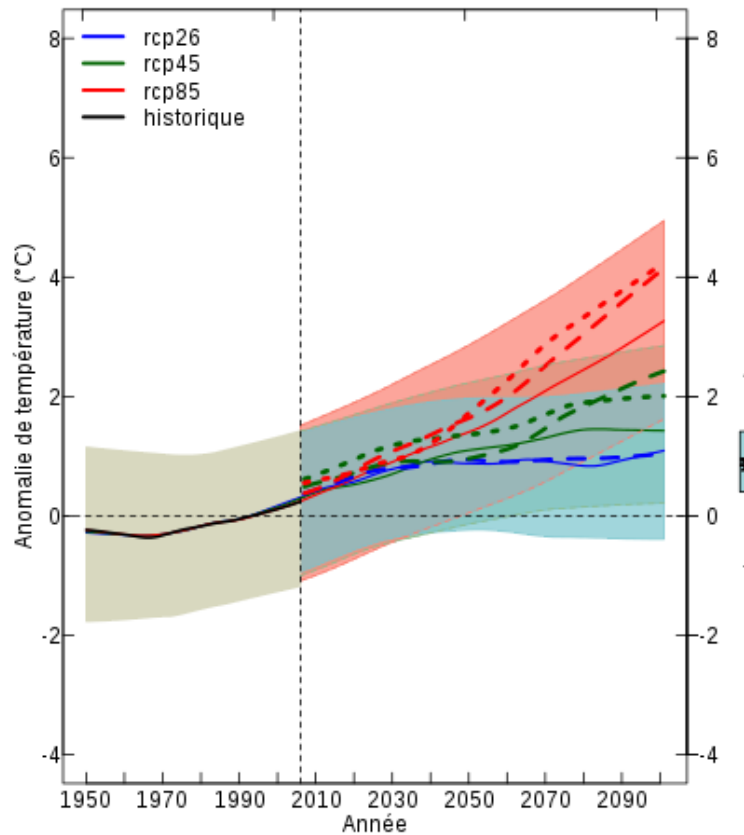


- **5<sup>th</sup> volume** on sea level change (February 2015)

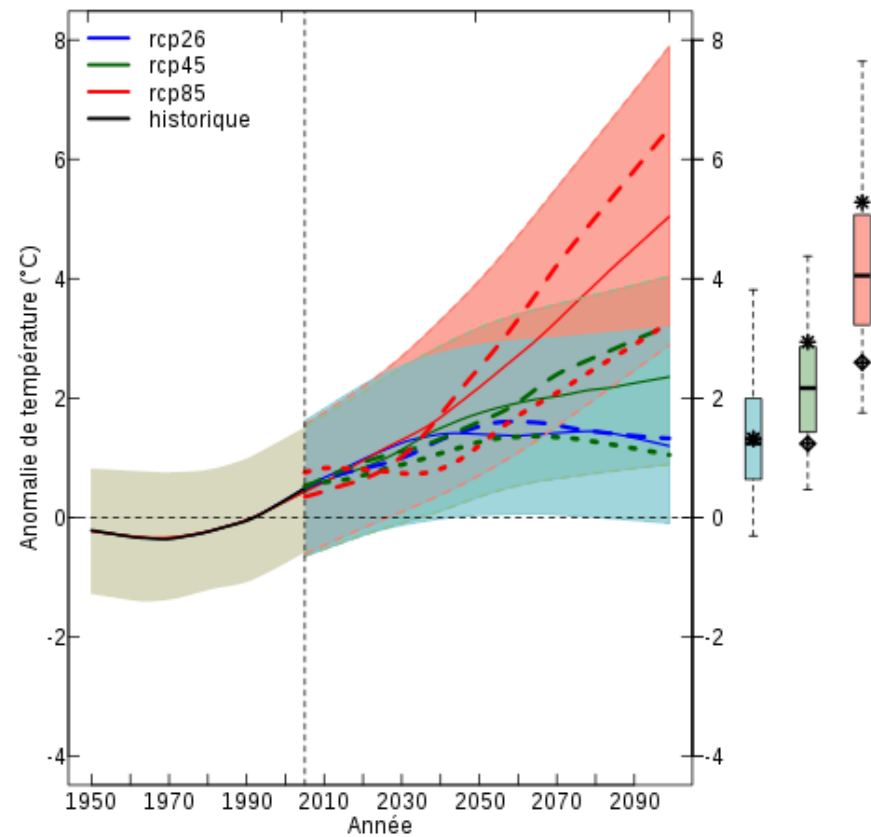


# Change of seasonal temperature averaged over metropolitan France (reference 1976-2005)

Winter



Summer



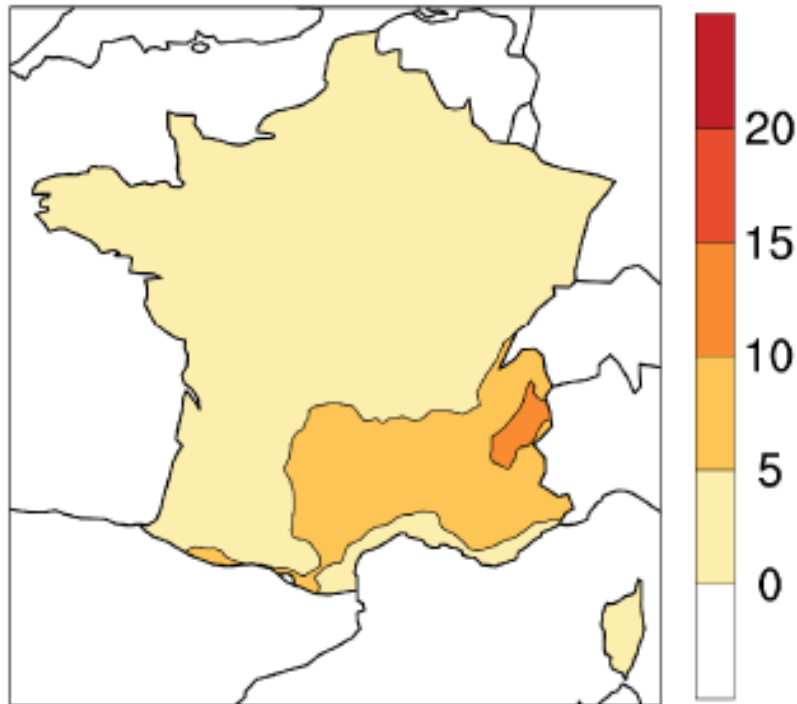
Shaded 5-95% confidence intervals and box-plots from CMIP5 simulations



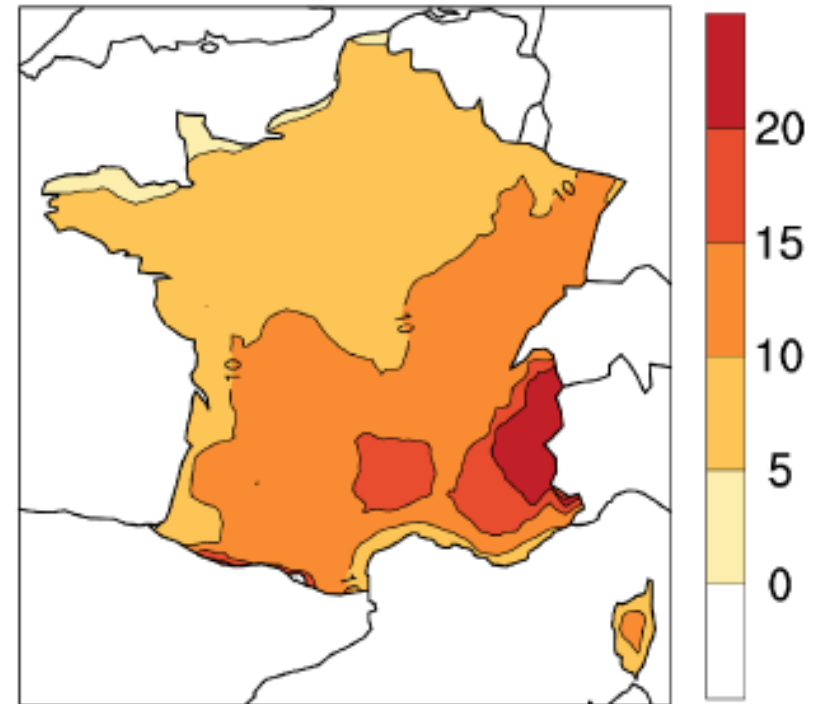
# Change in heat waves (number of days in Summer) from 1976-2005 to 2071-2100

RCP4.5

First quartile



Third quartile



Quartiles from Euro-cordex simulations corrected with Safran reanalysis (8km)

# Some lessons from DRIAS

- Certification of climate tools:
  - CMIP5 and Euro-Cordex simulations useful to estimate some uncertainties through a multi-model approach
  - Some specific simulations were not part of collaborative research projects
- Provision of tailored climate products :
  - New production is motivated by an added-value of new climate projections
  - The calculation of changes in extremes required corrections with a mesoscale reanalysis
- Performing new research development :
  - Specific simulations were produced in particular to extend climate change calculations to overseas territories to complete projections with RCP2.6 scenario.
  - Difficulty to match the research scales and the climate service requirements

# Some general conclusions regarding (regional) climate model projections

- **Climate projections:**

Ensemble of simulations from European and international projects are available but specific simulations remain needed to provide an added value due to increased resolution, new processes representation or domain extension. This is particularly the case for national services but also to satisfy specific user requirements.
- **Evaluation and quality control:**

The multi-model approach allows a better representation of uncertainties and existing ensemble of projections can be exploited whatever the model resolution.

# Some general conclusions regarding (regional) climate model projections

- **Climate data Store:**

Mesoscale reanalyses and local data series are required as well for model evaluation and bias corrections, as for downscaling methodology development and application.

- **Climate service organisation:**

The agenda of climate services production is not the same than the research agenda. Scientific experts from the climate research community have to be involved in climate services to communicate on new opportunities concerning model projections, and on new model capabilities for tailored climate products defined in interaction with final users.

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Thank you for your attention