



Modelling European Agriculture with Climate Change for Food Security



# Scenarios and related data for MACSUR2

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MACSUR Conference 2015

Integrated Climate Risk Assessment in Agriculture & Food

8-9 April 2015, University of Reading, UK

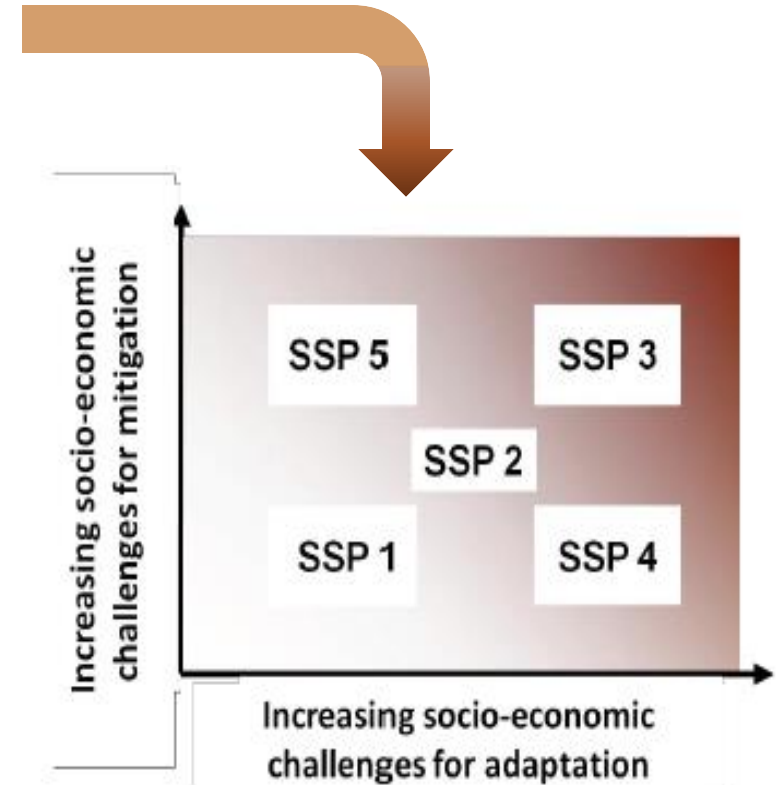
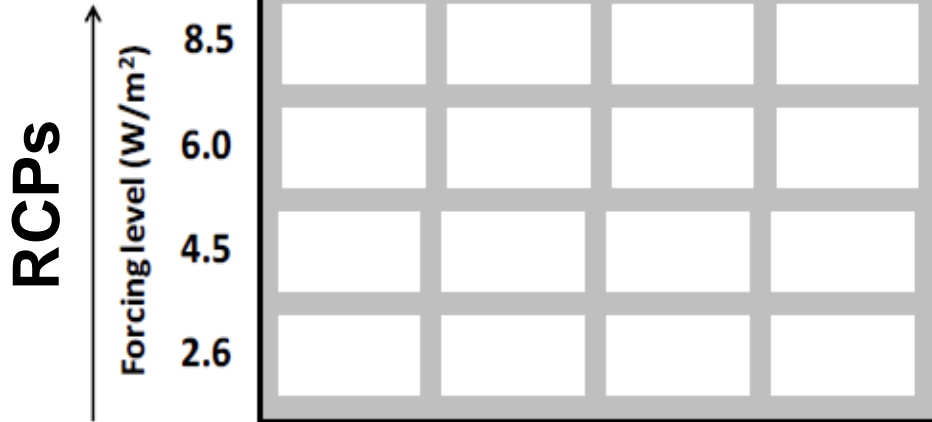
## Scenario selection for MACSUR2

- **Framing scenario selection (RCP/SSP)**
- **Ongoing scenario development in FP7 IMPRESSIONS**
- **Some examples of sources of data and scenarios**

# RCPs, SSPs and RAPs

Socio-economic reference pathway

SSP1    SSP2    SSP3    ...



## Representative Ag Pathways

- economic & social development narratives
- agricultural technology trends
- prices and costs of production
- ag, mitigation & other policy



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# Scenario selection for IMPRESSIONS

	SSP1	SSP3	SSP4	SSP5
RCP8.5	o	XX	o	
RCP4.5	XX	XX	XX	o



**IMPRESSIONS – Impacts and Risks from High-End Scenarios: Strategies for Innovative Solutions** ([www.impressions-project.eu](http://www.impressions-project.eu))



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## Scenario selection for IMPRESSIONS

	SSP1	SSP3	SSP4	SSP5
RCP8.5	o	XX	o	
RCP4.5	XX	XX	XX	o

- **Uses the RCP/SSP global scenario framework**
- **Pairs high-end climate (RCP8.5) with compatible socio-economic worlds (SSP5 and SSP3)**
- **Pairs low-end climate (RCP4.5) with compatible socio-economic worlds (SSP1, SSP3, SSP4) for which mitigation policy might also be required (SPAs)**
- **Facilitates comparison across SSPs for the same forcing (SSP4 vs SSP5 and SSP1 vs. SSP3 vs. SSP4)**
- **Facilitates comparison across forcings for the same SSP – SSP3 (RCP8.5 vs RCP4.5)**

**IMPRESSIONS** – Impacts and Risks from High-End Scenarios:  
Strategies for Innovative Solutions ([www.impressions-project.eu](http://www.impressions-project.eu))




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## ICONICS | International Committee on New Integrated Climate Change Assessment Scenarios

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### ICONICS COMMITTEE MEMBERSHIP

#### INTERNATIONAL COMMITTEE ON NEW INTEGRATED CLIMATE CHANGE ASSESSMENT SCENARIOS

ICONICS aims to organize the process of developing new socioeconomic scenarios to facilitate interdisciplinary research and assessment on climate change mitigation and adaptation. Proposed at the workshop on [The Nature and Use of New Socioeconomic Pathways for Climate Change Research](#) in 2011, the committee's goals are to:

- Complete Shared Socioeconomic Pathways (SSPs) including narratives and quantification from models and other sources; and
- Facilitate establishment of a research program and limited coordinating infrastructure for long term IAV-IAM development and application of integrated scenarios beyond the IPCC AR5.

Read more [background information](#) on the process of developing new socioeconomic scenarios.

#### WORKING GROUPS

The work of the committee is organized into six [working groups](#).


#### PUBLICATIONS

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## ICONICS WORKING GROUPS

### WORKING GROUPS

ICONICS work is initially focused on several high priority tasks. Informal working groups are coordinating inputs from interested individuals and developing drafts for circulation and comment. The list of working groups below includes links to individual working group pages for additional information. If you are interested in working on one of these topics, please contact the working group chair listed.

- **Narratives for SSPs**  
Co-chairs: [Brian O'Neill](#), [Elmar Kriegler](#)
- **IAV-IAM handshake document and research community interactions**  
Chair: [Jae Edmonds](#)
- **IAM quantitative drivers and IAM scenarios for SSPs**  
Co-chairs: [Detlef van Vuuren](#), [Keywan Riahi](#)
- **IAV quantitative elements and evaluation metrics**  
Co-chairs: [Marc Levy](#), [Bas van Ruijven](#)
- **Nested scenarios across geographies and time**  
Co-chairs: [Kasper Kok](#), [Ben Preston](#)
- **Roadmap for future IAV-IAM collaboration on scenarios**  
Chair: [Stephane Hallegatte](#)

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**Working Groups**

- [Narratives for SSPs](#)
- [IAV-IAM handshake document...](#)
- [IAM quantitative drivers...](#)
- [IAV quantitative elements...](#)
- [Nested scenarios across...](#)
- [Roadmap for future IAV-IAM...](#)

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# SSP Database at IIASA

<https://secure.iiasa.ac.at/web-apps/ene/SspDb/dsd?Action=htmlpage&page=welcome>



**SSP Database**  
Version 0.9.3

About
Series
Countries
Scatter
Download

Introduction

**SSP Database (version 0.93):**

Disclaimer

Note that the community review of the SSP data has been completed in October 2012. The SSP data on this website has been updated since then and reflects changes from March 2013 in response to the reviewer comments. Please send any comments or questions to

Tutorial

Region definitions

[ssp-comments@iiasa.ac.at](mailto:ssp-comments@iiasa.ac.at).

**Introduction**

The SSP database aims at the documentation of quantitative projections of the so-called Shared Socioeconomic Pathways (SSPs) and related Integrated Assessment scenarios. The SSPs are part of a new framework that the climate change research community has adopted to facilitate the integrated analysis of future climate impacts, vulnerabilities, adaptation, and mitigation. Information about the scenario process and the SSP framework can be found in [Moss et al. \(2010\)](#), [Arnell et al. \(2011\)](#), [van Vuuren et al. \(2012\)](#) and [Kriegler et al. \(2012\)](#). The framework is built around a matrix that combines climate forcing on one axis (as represented by the Representative Forcing Pathways) and socio-economic conditions on the other. Together, these two axes describe situations in which mitigation, adaptation and residual climate damage can be evaluated.

The SSP quantifications build upon the collaborative effort between the IAV and IAM community, which has met in a series of meetings and identified a limited set of five SSP storylines/narratives ([O'Neill et al, 2012](#)). The narratives describe the main characteristics of the SSP future development pathways. They served as the starting point for the identification of internally consistent assumptions for the quantification of SSP elements. Different modeling tools can be used to develop quantifications of these storylines, including factors like population, economic development, land use and energy use.

Currently (May 2012), the database includes projections for population and economic development, which are the elements that are most used as basis of both integrated assessment and IAV studies. Specifically, for the following elements quantifications are available:

1. population by age, sex, and education;
2. urbanization; and

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current user: guest [logout](#)
?



# SSP Database at IIASA

<https://secure.iiasa.ac.at/web-apps/ene/SspDb/dsd?Action=htmlpage&page=welcome>

The screenshot displays the SSP Database web application interface. The top navigation bar includes the logo "Science for Global Insight" and the text "SSP Database Version 0.9.3". The main navigation menu contains "About", "Series", "Countries", "Scatter", and "Download". The "Countries" tab is active, and the instruction "Select region(s), scenario(s), and variable to define your query" is shown.

The interface is divided into three main sections for query definition:

- (1.) Regions:** A tree view showing a hierarchy of regions. "Countries" is expanded to show sub-regions: AFR, CPA, EEU, FSU, LAC, MEA, NAM, PAO, PAS, SAS, WEU, and a list of countries: Austria, Belgium, Cyprus, and Denmark.
- (2.) Model/Scenarios:** A tree view showing selected scenarios. "IIASA-WiC Population V9" is selected, with sub-scenarios SSP1, SSP2, SSP3, SSP4d, and SSP5. "OECD GDP V9 (25-Mar-201)" is also selected, with sub-scenarios SSP1 through SSP5. "IIASA GDP V9 (19-Feb-201)" is selected, with sub-scenarios SSP1, SSP2, and SSP3.
- (3.) Variable:** Two dropdown menus, both set to "data". A tree view shows the variable structure: GDP (with sub-variables PPP and Population), and Population (with sub-variables Total, Male, Female, and Urban, and a sub-variable Share).

At the bottom, there is a section labeled "Query Results:" which is currently empty.

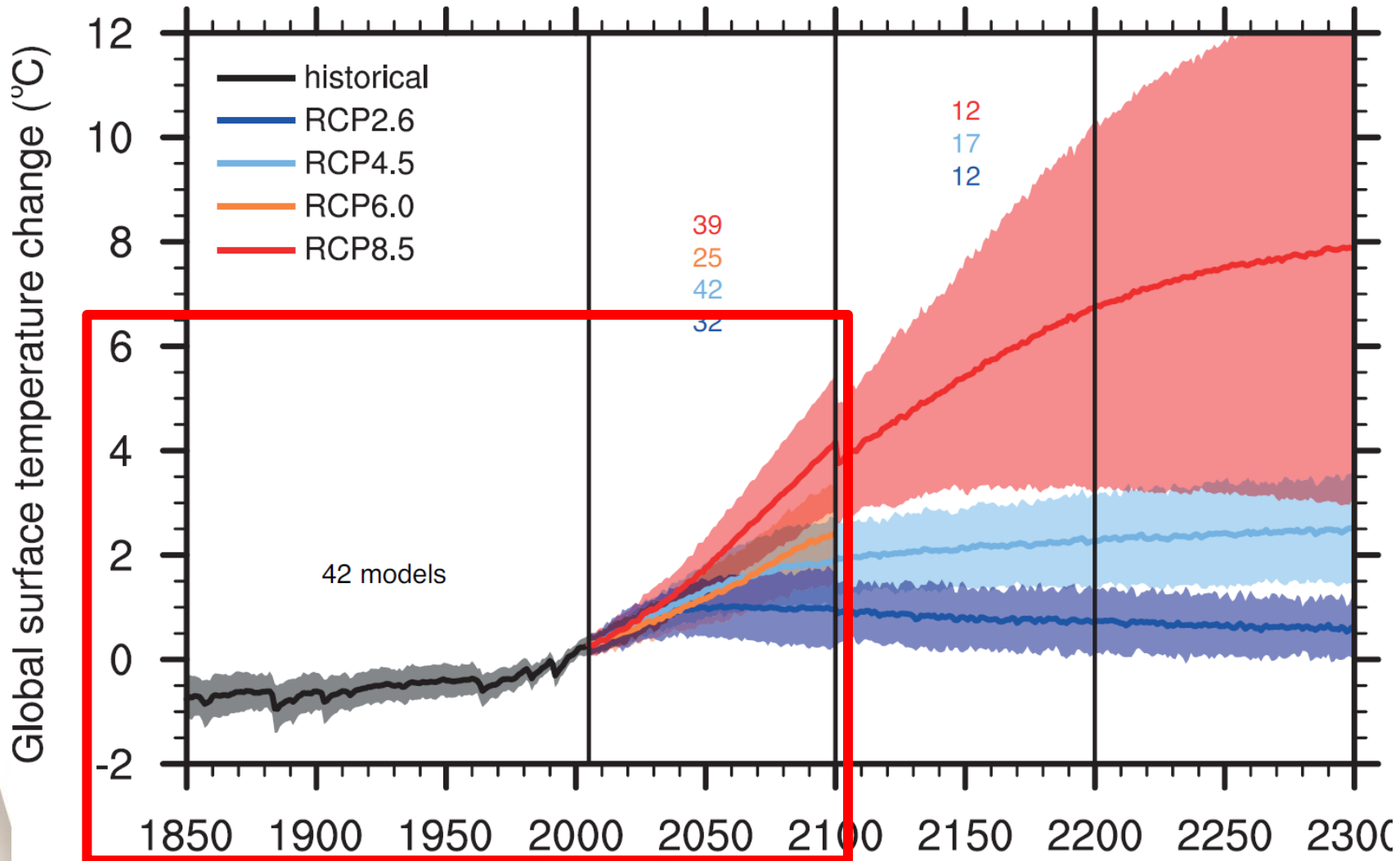


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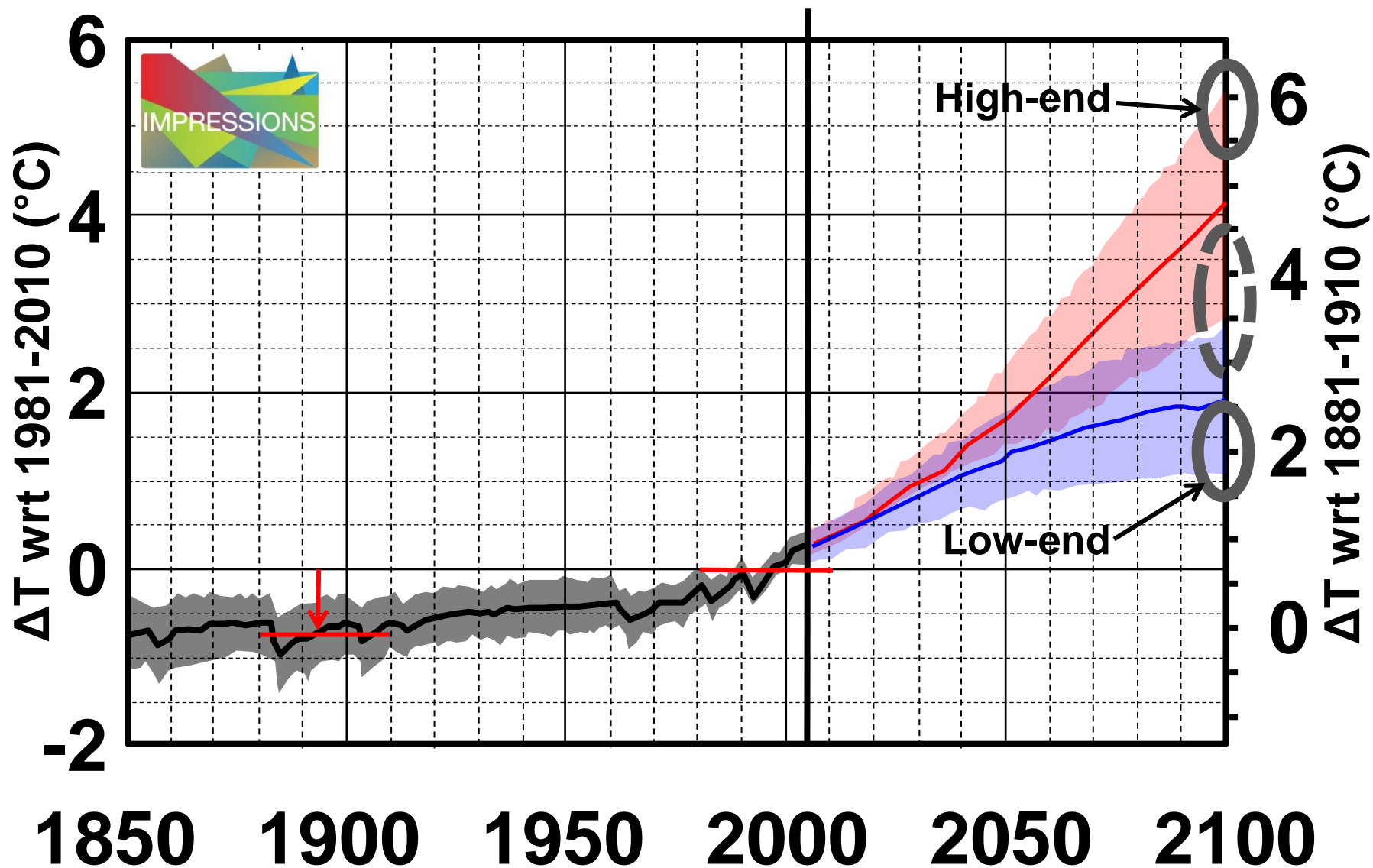
## Climate scenario selection for IMPRESSIONS

- **Core set and Extended set**
- **Climate system forcing:** RCP8.5 and RCP4.5 (radiative forcing by 2100 of 8.5  $\text{Wm}^{-2}$  and 4.5  $\text{Wm}^{-2}$  relative to pre-industrial)

Global annual mean surface air temperature anomalies (wrt 1986–2005) from CMIP5 concentration-driven experiments. Projections are shown for each RCP for the multi-model mean (solid lines) and the 5 to 95% range ( $\pm 1.64$  standard deviation) across the distribution of individual models (shading) across the distribution of individual models (shading)



# CMIP5 ensemble global mean temperature change for RCP8.5 and RCP4.5 relative to recent (1981-2010) and pre-industrial (1881-1910)





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## Climate scenario selection for IMPRESSIONS

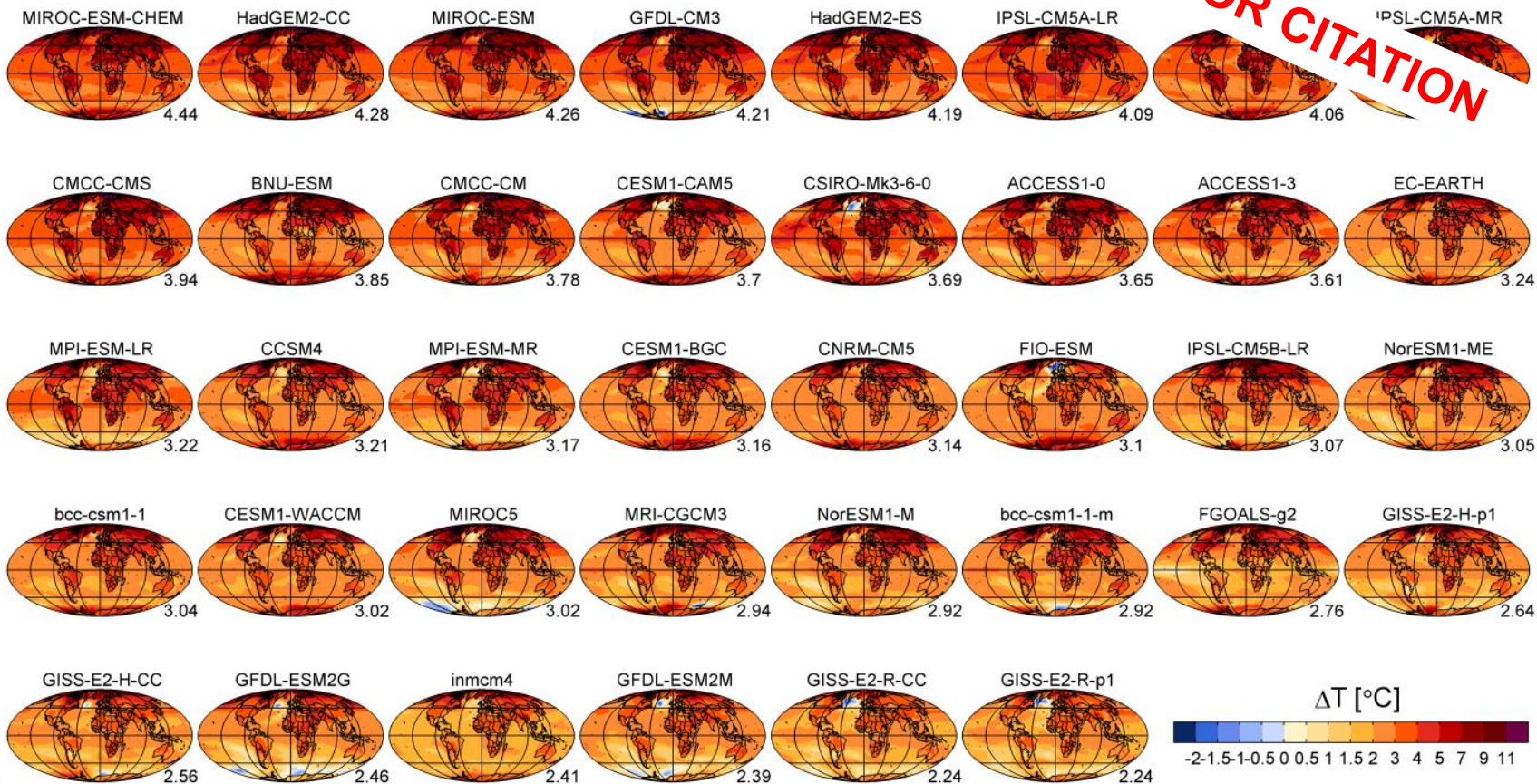
- **Core set and Extended set**
- **Climate system forcing:** RCP8.5 and RCP4.5 (radiative forcing by 2100 of 8.5 Wm<sup>-2</sup> and 4.5 Wm<sup>-2</sup> relative to pre-industrial)
- **CMIP5 global models:** simulations to 2100 assuming a given forcing conducted for the CMIP5 exercise using different Earth system model (ESM) simulations
- **Probabilistic climate:** regional projections of temperature and precipitation change (joint distributions) under a given forcing (two methods based on CMIP5)
- **Dynamically downscaled:** based on dynamical downscaling of CMIP5 global model outputs over Europe in the Co-Ordinated Regional Downscaling EXperiment (CORDEX) using fine resolution regional climate models
- **Climate sensitivity:** select GCMs with a high or low climate sensitivity
- **Regional patterns:** Spatial and seasonal patterns of changes in precipitation (primary criterion) and temperature over Europe, used to guide the selection of a manageable number of projections showing a representative range of patterns.

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Strategies for Innovative Solutions ([www.impressions-project.eu](http://www.impressions-project.eu))



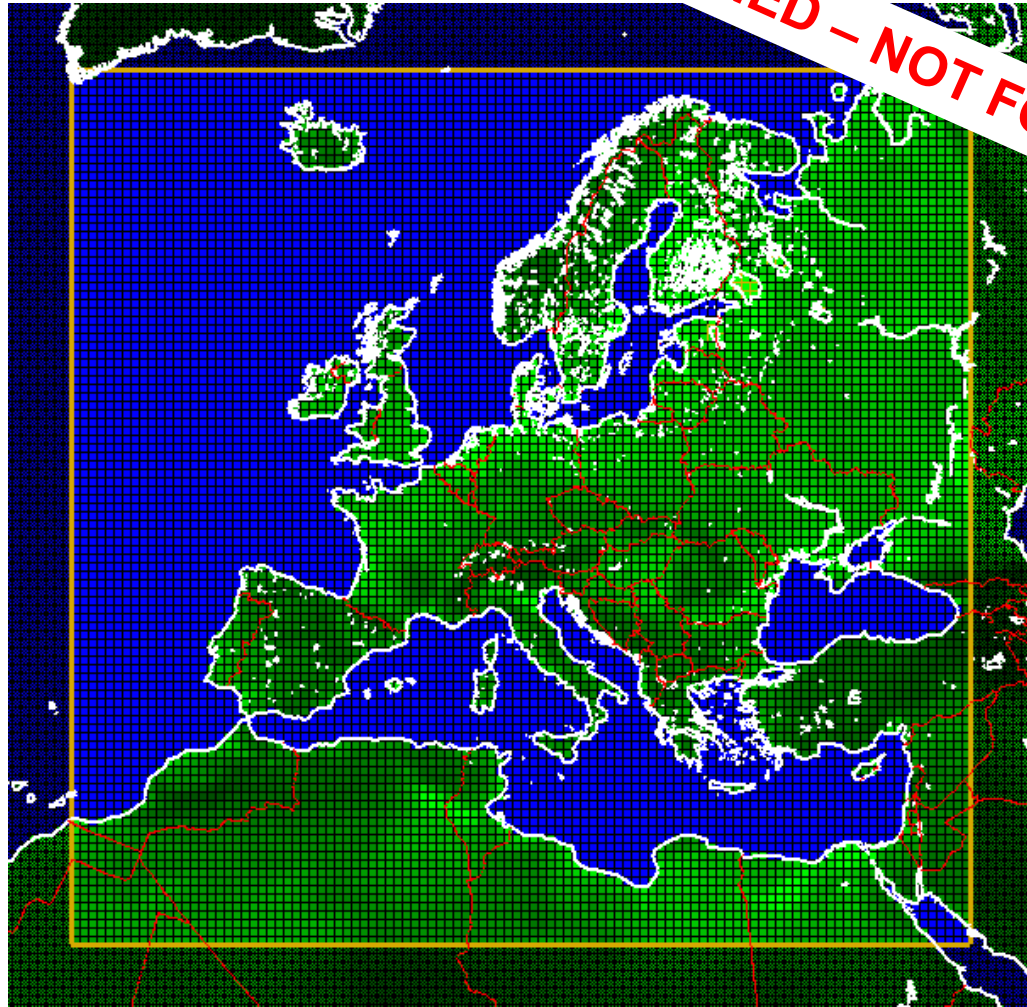
# CMIP5 annual mean temperature changes (2071-2100 vs. 1981-2010) for 28 models under RCP8.5 (ranked by global mean temperature change)

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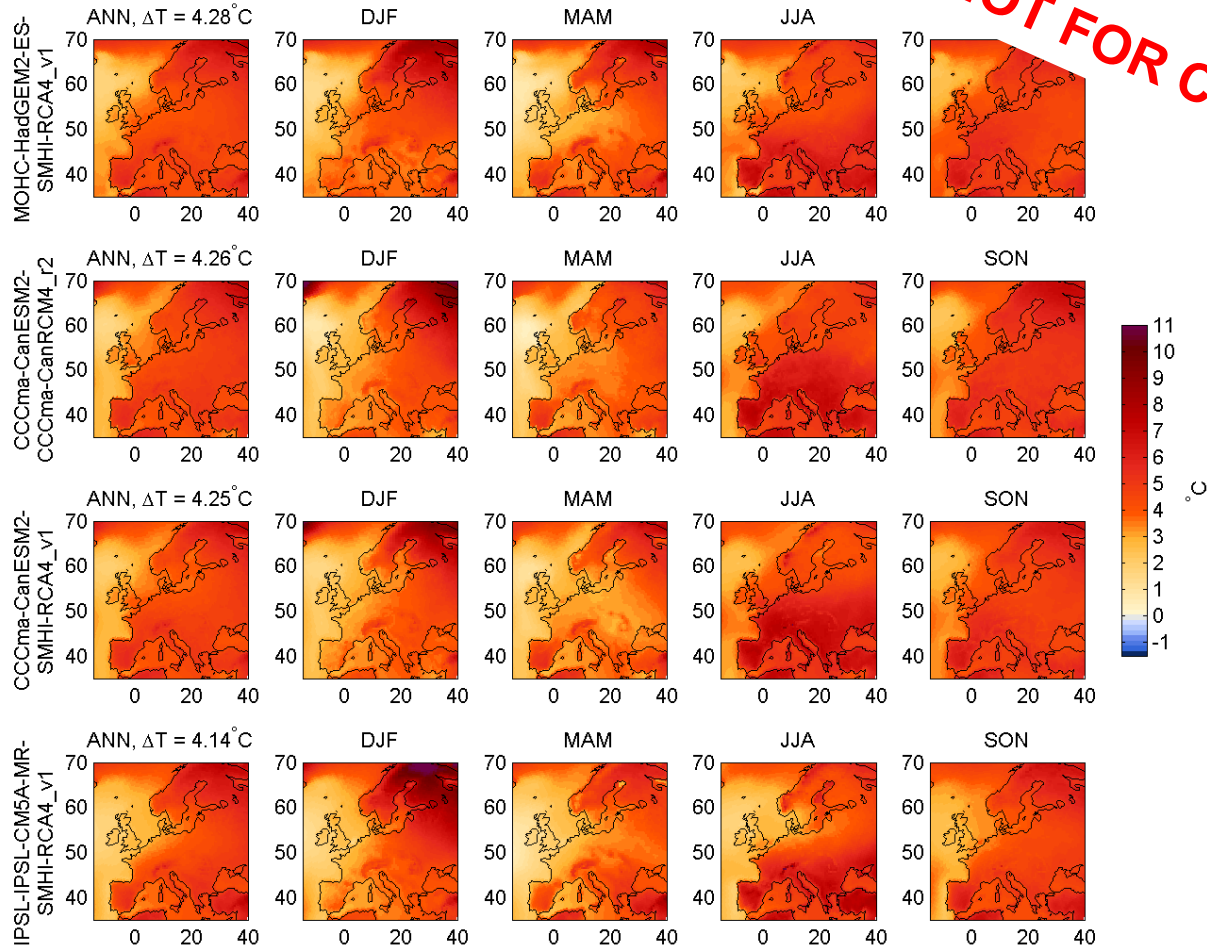
# EURO-CORDEX domain

[[http://wcrp-cordex.ipsl.jussieu.fr/index.php?option=com\\_community&view=domain-euro-cordex](http://wcrp-cordex.ipsl.jussieu.fr/index.php?option=com_community&view=domain-euro-cordex)]



# CORDEX RCM annual & seasonal mean temperature changes (2071-2100 vs. 1971-2010) for RCP8.5 over Europe (four examples rank order by annual temperature change)

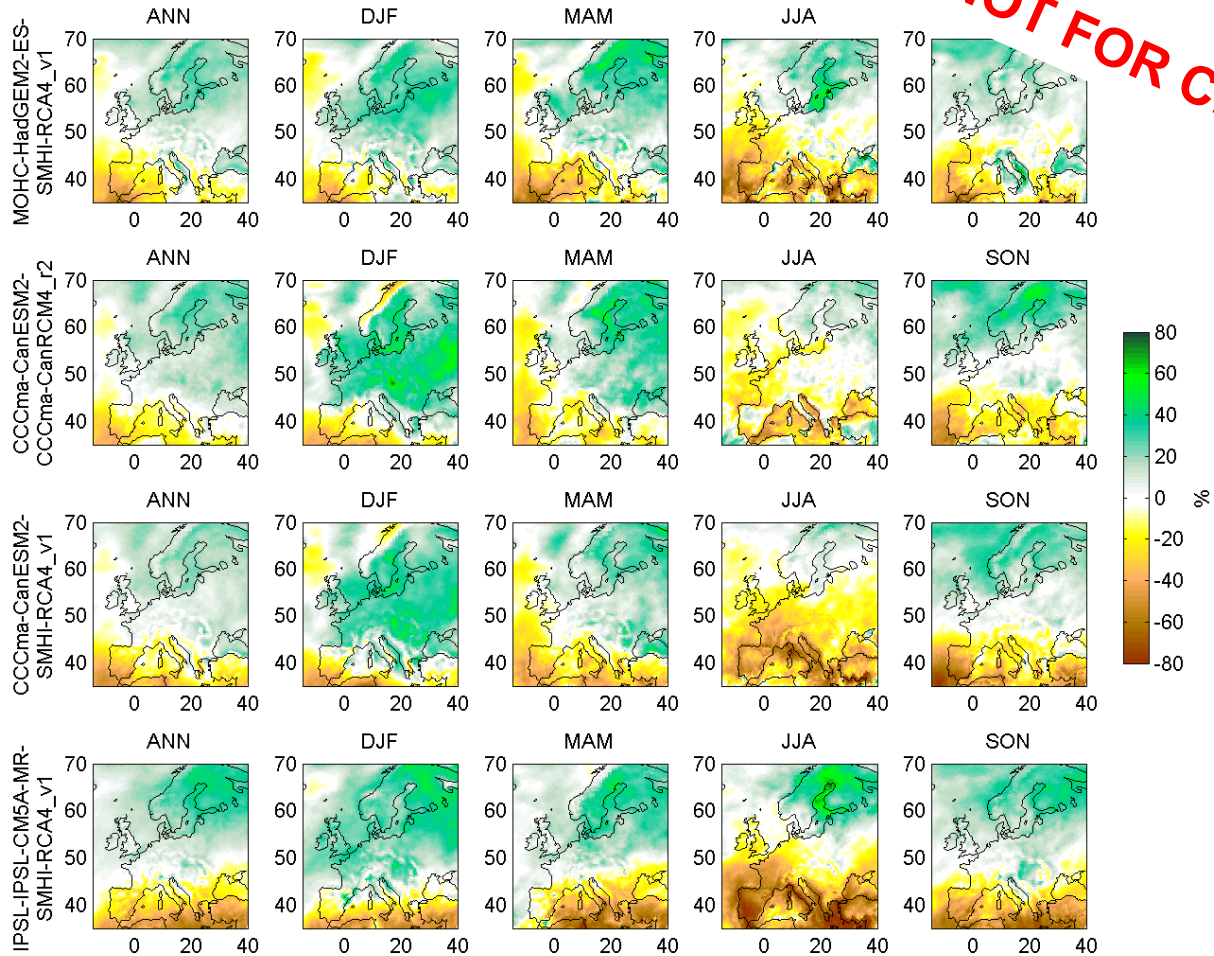
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# CORDEX RCM annual and seasonal mean precipitation changes (2071-2100 vs. 1971-2010) for RCP8.5 over Europe (four examples ranked by temperature change)

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Welcome to this ESGF P2P Node



### Peer Nodes

- [ANL Node](#) 
- [BADC Node](#) 
- [BNU Node](#) 
- [CCCR-IITM Node](#) 
- [CMCC Node](#) 
- [DKRZ Node](#) 
- [DMI Node](#) 
- [E-INIS-ICHEC Node](#) 
- [IPSL Node](#) 
- [NASA-GSFC Node](#) 
- [NASA-JPL Node](#) 
- [NCAR Node](#) 
- [NCI Node](#) 
- [NERSC Node](#) 
- [NOAA-ESRL Node](#) 
- [NOAA-GFDL Node](#) 
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- [PIK Node](#) 
- [SMHI-LIU-NSC Node](#) 
- [UIO Node](#) 
- [UNICAN Node](#) 



### About esgf-pcmdi-9


The PCMDI mission is to develop improved methods and tools for the diagnosis and intercomparison of general circulation models (GCMs) that simulate the global climate. The need for innovative analysis of GCM climate simulations is apparent, as increasingly more complex models are developed, while the disagreements among these simulations and relative to climate observations remain significant and poorly understood. The nature and causes of these disagreements must be accounted for in a systematic fashion in order to confidently use GCMs for simulation of putative global climate change.



### Resources



#### Quick Links

- [Create Account](#)
- [MyProxyLogin](#)
- [Expert Search \(XML\)](#)
- [Wget Script Generator](#)
- [ESGF aggregated RSS feed](#) 
- [Contact ESGF](#)



#### Instructions

- [ESGF Full User Guide](#)
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- [Search Controlled Vocabulary](#)
- [Wget Scripts Info](#)
- [ESGF Scripting](#)
- [Tutorial: Download Strategies](#)
- [Using Globus Online](#)
- [Subscribing to RSS Notification](#)

# IPCC Data Distribution Centre

<http://www.ipcc-data.org/>

The screenshot shows the IPCC Data Distribution Centre website. The browser address bar displays 'www.ipcc-data.org'. The page header includes the IPCC logo and the text 'INTERGOVERNMENTAL PANEL ON climate change', along with logos for WMO and UNEP. Navigation options include 'Search', 'Advanced search', 'Help', 'Site map', and a dropdown for 'IPCC web sites'. A left sidebar contains a menu with items like 'IPCC Site', 'DDC Home', 'About the DDC', 'Guidance on the use of data', 'Scenario process for AR5', 'Data: Observations', 'Data: Simulations', 'Data: Synthesis', and 'Visualisation'. The main content area features a 'Welcome to the IPCC Data Distribution Centre' section with a location field set to 'DDC Home'. The welcome text states: 'Welcome to the Data Distribution Centre (DDC) of the Intergovernmental Panel on Climate Change (IPCC). The DDC provides climate, socio-economic and environmental data, both from the past and also in scenarios projected into the future. Technical guidelines on the selection and use of different types of data and scenarios in research and assessment are also provided. The DDC is designed primarily for climate change researchers, but materials contained on the site may also be of interest to educators, governmental and non-governmental organisations, and the general public. The DDC is overseen by the IPCC Task Group on Data and Scenario Support for Impact and Climate Analysis (TGICA) and jointly managed by the British Atmospheric Data Centre (BADC) in the United Kingdom, the CSU World Data Center Climate (WDCC) in Germany, and the Center for International Earth Science Information Network (CIESIN) at Columbia University, New York, USA. The data are provided by co-operating modelling and analysis centres.' A 'Highlights' box on the right mentions 'The DDC User Survey' and 'Search the latest IPCC report'. Below the main text are three tabs: 'About the DDC', 'Guidance on use of data', and 'Discover, view and download data'. The 'About the DDC' tab is active, showing an 'Introduction to the IPCC Data Distribution Centre (Full page)' section. This section states: 'The DDC has been established to facilitate the timely distribution of a consistent set of up-to-date scenarios of changes in climate and related environmental and socio-economic factors for use in climate impacts assessments. The intention is that these new assessments can feed into the review process of the IPCC (Full page)'. Under 'In this section:', there is a list of links: 'Why the DDC exists', 'What the DDC provides', 'Who runs the DDC', 'User surveys', and 'How the site is arranged'. The footer of the page includes logos for the British Atmospheric Data Centre, the Department of Energy & Climate Change, and DKRZ (Deutsches Klimarechenzentrum).



## IS-ENES climate4impact portal

Welcome to the IS-ENES climate4impact portal, oriented towards climate change impact modellers, impact and adaptation consultants, as well as other experts using climate change data.

Here you will find [access to data](#) and *quick looks* of global climate models (GCM) scenarios, as well as regional climate model (RCM) and downscaled higher resolution climate data. The portal provides data transformation tooling for tailoring data to your needs and [mapping & plotting capabilities](#).

[Guidance](#) on how to use climate scenarios, documentation on the climate system, [frequently asked questions](#) and examples in several impact and adaptation themes are presented and described, along with the steps required to go from GCM data to impact model input data.

### Latest

- Workshop held on design of scientific portals (Nov 2014, KNMI (NL)) [download the presentations](#)
- The climate4impact portal is operational since 15 April 2014: [read more](#).



Click on one of these images to go to a specific climate change impact and adaptation theme.



Exploring climate model data

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### Search

<b>Project</b>	<input type="checkbox"/> CMIP5	<input type="checkbox"/> CORDEX	+					
<b>Variable</b>	<input type="checkbox"/> Temperature <input type="checkbox"/> Min temperature <input type="checkbox"/> Max temperature  <input type="checkbox"/> Evaporation <input type="checkbox"/> Potential evaporation	<input type="checkbox"/> Precipitation <input type="checkbox"/> Conv. precipitation <input type="checkbox"/> Snow  <input type="checkbox"/> Surface pressure <input type="checkbox"/> Pressure	<input type="checkbox"/> Windspeed <input type="checkbox"/> Max windspeed <input type="checkbox"/> Eastward wind <input type="checkbox"/> Northward wind	<input type="checkbox"/> Shortwave radiation down <input type="checkbox"/> Shortwave radiation up <input type="checkbox"/> Longwave radiation down <input type="checkbox"/> Longwave radiation up <input type="checkbox"/> Diffuse radiation <input type="checkbox"/> Total cloud cover	<input type="checkbox"/> Surface specific humidity <input type="checkbox"/> Surface relative humidity <input type="checkbox"/> Specific humidity <input type="checkbox"/> Relative humidity <input type="checkbox"/> Surface relative humidity <input type="checkbox"/> Max relative humidity <input type="checkbox"/> Minimum relative humidity	+		
<b>Frequency</b>	<input type="checkbox"/> 3 hourly	<input type="checkbox"/> daily	<input type="checkbox"/> monthly	+				
<b>Time frame</b>				+				
<b>Experiment</b>	<input type="checkbox"/> Historical	<input type="checkbox"/> RCP26	<input type="checkbox"/> RCP45	<input type="checkbox"/> RCP60	<input type="checkbox"/> RCP85	<input type="checkbox"/> Evaluation	<input type="checkbox"/> 1pctCO2	+
<b>Domain</b>	<input checked="" type="checkbox"/> Search domain (CORDEX)			+				
<b>Models</b>	<input checked="" type="checkbox"/> Found 182 model(s)			+				

### Search datasets

Start search +

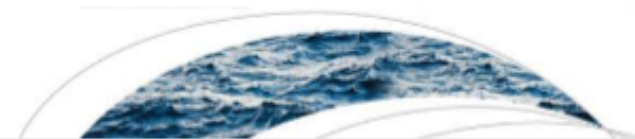


## Some other issues:

- **Bias correction of downscaled climate data, and/or**
- **Change factor ("delta change") method**
- **Observed datasets, e.g.:**
  - **Site data (availability?)**
  - **CRU E-OBS gridded data (daily: TG TN TX RR PP; 0.25° lat/lon)**
  - **Agri4Cast Data (daily: 25 km)**
  - **WATCH ERA-Interim data (3-hourly: T, Wind at 10m, PP, LWdown, SWdown, RR, Snowfall rate; 0.5° lat/lon resolution)**



# WATCH meteorological forcing data set



## Water Resources Research

### DATA AND ANALYSIS NOTE

10.1002/2014WR015638

#### Key Points:

- Global three hourly meteorological forcing data at half-degree spatial resolution
- Covers 1979–2012
- Improvements compared to the WATCH forcing data

#### Correspondence to:

G. P. Weedon  
graham.weedon@metoffice.gov.uk

#### Citation:

Weedon, G. P., G. Balsamo, N. Bellouin, S. Gomes, M. J. Best, and P. Viterbo (2014), The WFDEI meteorological forcing data set: WATCH Forcing Data methodology applied to ERA-Interim reanalysis data, *Water Resour. Res.*, 50, 7505–7514, doi:10.1002/2014WR015638

## The WFDEI meteorological forcing data set: WATCH Forcing Data methodology applied to ERA-Interim reanalysis data

Graham P. Weedon<sup>1</sup>, Gianpaolo Balsamo<sup>2</sup>, Nicolas Bellouin<sup>3</sup>, Sandra Gomes<sup>4</sup>, Martin J. Best<sup>5</sup>, and Pedro Viterbo<sup>4</sup>

<sup>1</sup>Met Office, Joint Centre for Hydrometeorological Research, Wallingford, UK, <sup>2</sup>European Centre for Medium-Range Weather Forecasts, Reading, UK, <sup>3</sup>Department of Meteorology, University of Reading, Reading, UK, <sup>4</sup>Instituto Dom Luiz, University of Lisbon, Lisbon, Portugal, <sup>5</sup>Met Office, Exeter, UK

**Abstract** The WFDEI meteorological forcing data set has been generated using the same methodology as the widely used WATCH Forcing Data (WFD) by making use of the ERA-Interim reanalysis data. We discuss the specifics of how changes in the reanalysis and processing have led to improvement over the WFD. We attribute improvements in precipitation and wind speed to the latest reanalysis basis data and improved downward shortwave fluxes to the changes in the aerosol corrections. Covering 1979–2012, the WFDEI will allow more thorough comparisons of hydrological and Earth System model outputs with hydrologically and phenologically relevant satellite products than using the WFD.

### 1. Introduction



# Joint Programming Initiatives in Europe





## **First Implementation Plan** *Approved December 2013*

- **Joint strategies**
- **Joint research funding**
- **Alignment of national research**
- **Collaboration with other research initiatives**

## **Fast Track Activities**

Preparing joint calls, elaborating strategies

### **2013 Joint calls (10M€)**

- Russian Arctic and Boreal systems
- Societal transformations to face CC

### **2015 joint call (15M€)**

- Climate predictability and inter-regional linkages
- Open to international with Belmont Forum (incl. India, China, Brazil...)

**MACSUR2 input?**

### ***Planned* 2016 joint call (75M€)**

- Research for Climate Services
- ERA-NET Co-funded by MS & EC