European research infrastructure for climate modelling

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ClimatEurope WP4
CMIP5 international coordinated experiments « Reference simulations »

Evaluate

Understand

Predict

Pattern correlation with observations

RCP 2.6
Change in average surface temperature (1986–2005 to 2081–2100)

RCP 8.5

IPCC AR5 (2013)

CMIP5
3400 simul. yrs up to > 12000 yrs
50 expts up to > 160 expts
2000 Tbytes (CMIP3: 36)

27 modelling groups
58 models

1 Canada
6 USA
7 Europe
1 Russia
5 China
1 Korea
4 Japan
2 Australia
IS-ENES: Infrastructure for ENES
European Network for Earth System modelling

Climate models
Environment software tools
ESM ca 1000 man years

High-performance computers & storage facilities

Data & metadata
Standards
Distributed database ESGF
> 20 000 registered users worldwide
Open access

Climate research & Impact research
Climate services

Support CMIP & CORDEX international coordinated experiments
Used in IPCC Assessments Reports
Sharing of climate model data
CMIP/CORDEX

Support CMIP cycles
CMIP5
Preparation of CMIP6
Model documentation & support

Support sharing of CORDEX data through ESGF
Euro-CORDEX and Africa-CORDEX
http://is-enes-data.github.io/CORDEX_status.htm
Status at 05/04/2017
AFR 44 (8 RCMs), EUR 11 (8 RCMs), EUR 44 (8 RCMs),
Fewer for ARC 44 (5) and other domains
Mostly European models

<table>
<thead>
<tr>
<th>Model</th>
<th>Models supported</th>
</tr>
</thead>
<tbody>
<tr>
<td>NCC</td>
<td>NorESM1-M, NorESM1-ME</td>
</tr>
<tr>
<td>MPI-M</td>
<td>MPI-ESM-LR, MPI-ESM-MR, MPI-ESM-P</td>
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<tr>
<td>MOHC (with INPE)</td>
<td>HadCM3, Hadcm3Q, HadGEM2-A, HadGEM2-CC, HadGEM2-ES</td>
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<tr>
<td>EC-EARTH</td>
<td>EC-EARTH</td>
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<tr>
<td>IPSL</td>
<td>IPSL-CM5A-LR, IPSL-CM5A-MR, IPSL-CM5B-LR</td>
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<tr>
<td>CNRM-CERFACS</td>
<td>CNRM-CM5, CNRS-CM5-2</td>
</tr>
<tr>
<td>CMCC</td>
<td>CMCC-CESM, CMCC-CM, CMCC-CMS</td>
</tr>
</tbody>
</table>

DKRZ support
Inter-Sectoral Impact MIP
Platform for impact researchers
Explore climate data & perform analysis

Including:
• In-depth documentation and guidance
• Use cases from impact researchers
• Perform calculations / Data processing: WPS
• Downscaling portal

http://climate4impact.eu/
Copernicus Climate Change Service C3S at ECMWF

Climate Data Store
- Reanalyses
- Satellite data (ESA CCI)
- Seasonal Forecasts
- Projections (Global/Regional)

Projections: broker on ESGF
GLOBAL (34a) & REGIONAL (34b)

Lot 1 - CP4CDS:
ESGF node for C3S (CEDA et al.)

Lot 2 - MAGIC:
Multi-model product generation (KNMI et al.)

Lot 3 - CRECP:
Roadmap towards a reference set of climate projections (MetOffice and IPSL)

In negotiation

Lot 1:
Access to CORDEX data (IPSL et al.)

Lot 2:
Set of regional simulations for Europe (SMHI et al.)
Linking the European climate modelling research infrastructure to climate services

Data & metadata

CMIP & CORDEX

Climate services

Climate & Impact research

Downstream services

e.g.
ESM research infrastructure: An asset for climate services:
- Ensemble mean, uncertainty, well evaluated, indicators
- Common database with common standards

Climate services: an opportunity for ESM research infrastructure
- Wider use and impact
- Better integration with observations & predictions: also serving research

Some limitations to overcome

CMIP/CORDEX
- May not answer all needs of CS (e.g. limited set of scenarios)
- Need for downscaling & bias adjustments
- Future evolution? Research versus operational?

Data Infrastructure:
- Need for a sustained European and international research infrastructure