Data Evaluation for Climate Models

C3S_51_Lot4

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Content

- About DECM
- Main findings of the project
- Goals for 2018
- Discussion

Introduction

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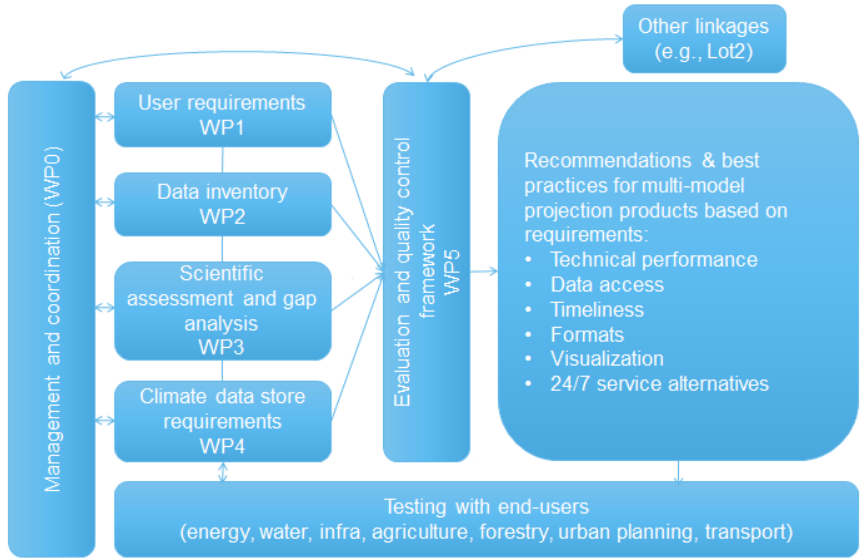
- Implementation period: August 2016 – December 2018
- Main **goals of the DECM** (Data Evaluation for Climate Models) project:
  1. Assess user requirements on usage and understanding of climate model ensembles and uncertainties
  2. Investigate available climate data catalogues from the point of fulfilling various user needs
  3. Identifying scientific gaps – how quality of provided data can be ensured for different tasks?

Provide recommendations for CDS and C3S's Evaluation and Quality Control Framework



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Project team

- Finnish Meteorological Institute, Finland – Coordinator/Provider
- Subcontractors:
  - University of Helsinki, Finland
  - CSC – Tietotekniikan keskus, Finland
  - Meteorologisk Institutt, Norway
  - Danmarks Meteorologiske Institut, Denmark
  - Helmholtz-Zentrum Geesthacht, Climate Service Center Germany (GERICS)
  - Országos Meteorológiai Szolgálat, Hungary
  - ABHL, France

UNIVERSITY OF HELSINKI

CSC – TIETEEN TIETOTEKNIIKAN KESKUS

Norwegian Meteorological Institute

DMI

OMSZ

GERICS Climate Service Center Germany

An institution of Helmholtz-Zentrum Geesthacht

ABHL

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Users are in focus

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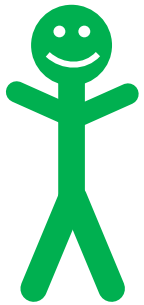

Data user

Use raw or slightly post-processed climate model *data*

Product user

Use information *products* based on climate model data (e.g. maps, graphs)

Non user

Don't use climate information (yet)

The survey

What are the user needs ↔ what is available → what is missing?

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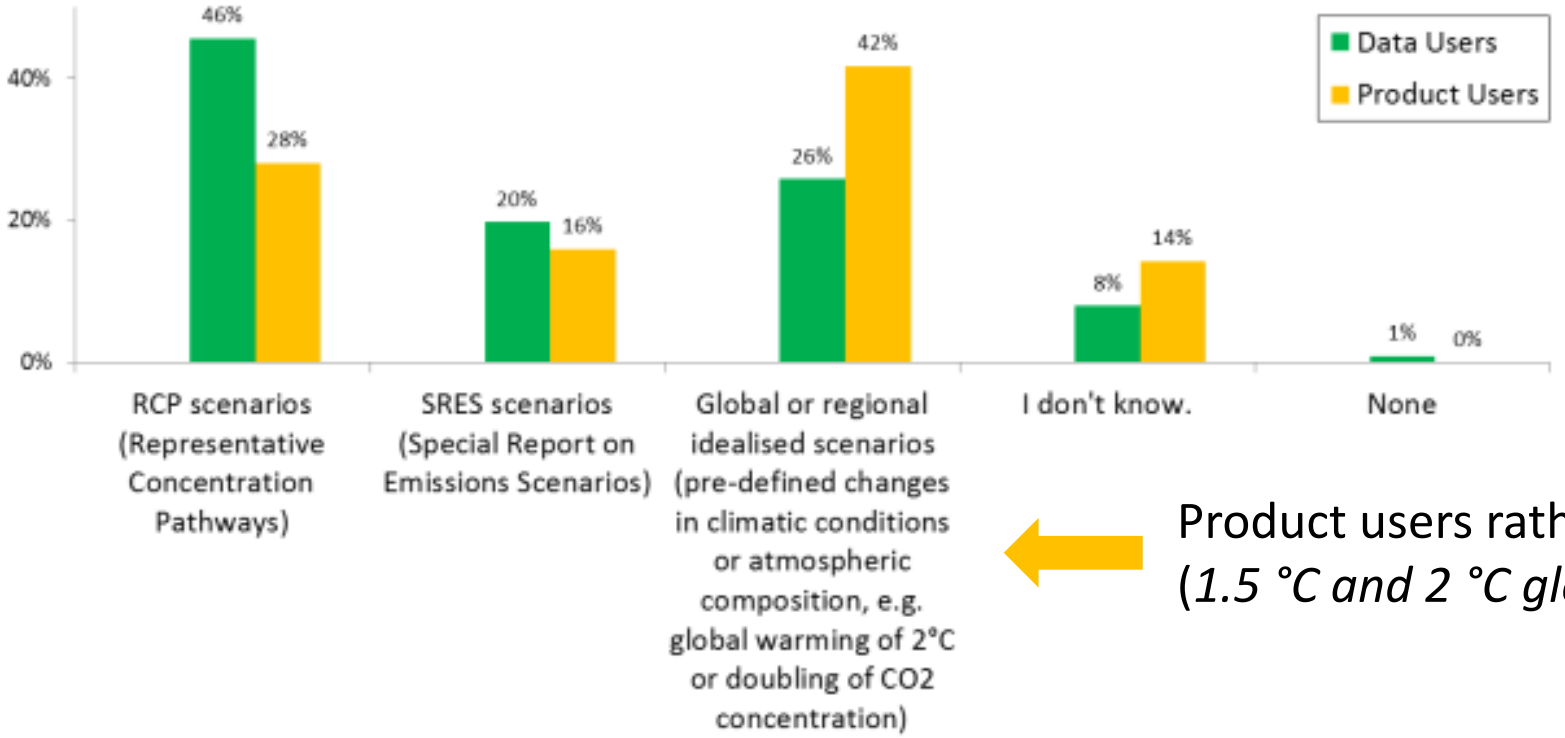
Result of the survey - scenarios

What type of scenario they use most often?

Data users mostly prefer RCP scenarios (*RCP8.5, RCP4.5, RCP2.6, RCP6.0*) → availability?

preference



Product users rather chose idealised scenarios (*1.5 °C and 2 °C global warming*)

→ Postprocessing is needed

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Joint assessment of Euro-CORDEX

Extended basic + Radiation + Pressure level	Extended basic + Radiation + Pressure level	Extended basic + Radiation + Pressure level
0.44° horizontal resolution (EUR-44)	0.44° horizontal resolution (EUR-44)	0.44° horizontal resolution (EUR-44)
historical + RCP8.5	historical + RCP8.5 + RCP4.5	historical + RCP8.5 + RCP4.5 + RCP2.6
HIRHAM5 - EC-EARTH	HIRHAM5 - EC-EARTH	
RACMO22E - EC-EARTH	RACMO22E - EC-EARTH	
RACMO22E - HadGEM2-ES	RACMO22E - HadGEM2-ES	RACMO22E - HadGEM2-ES
RCA4 - CanESM2	RCA4 - CanESM2	
RCA4 - CNRM-CM5	RCA4 - CNRM-CM5	
RCA4 - CSIRO-Mk3-6-0	RCA4 - CSIRO-Mk3-6-0	
RCA4 - EC-EARTH	RCA4 - EC-EARTH	RCA4 - EC-EARTH
RCA4 - IPSL-CM5A-MR	RCA4 - IPSL-CM5A-MR	
RCA4 - MIROC5	RCA4 - MIROC5	RCA4 - MIROC5
RCA4 - HadGEM2-ES	RCA4 - HadGEM2-ES	RCA4 - HadGEM2-ES
RCA4 - MPI-ESM-LR	RCA4 - MPI-ESM-LR	RCA4 - MPI-ESM-LR
RCA4 - NorESM1-M	RCA4 - NorESM1-M	RCA4 - NorESM1-M
RCA4 - GFDL-ESM2M	RCA4 - GFDL-ESM2M	
REMO2009 - MPI-ESM-LR	REMO2009 - MPI-ESM-LR	REMO2009 - MPI-ESM-LR
Number of simulations: 14	Number of simulations: 14	Number of simulations: 7

available variables

0.44° horizontal resolution

Different scenarios

- RCP8.5 and RCP4.5 dominate
- Some GCMs and RCMs are over- or underrepresented in Euro-CORDEX
- Different models share similar physics

Ensemble mean and spread might be distorted

Bias adjusted daily data available

Date: 02/2017

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Type of post-processing

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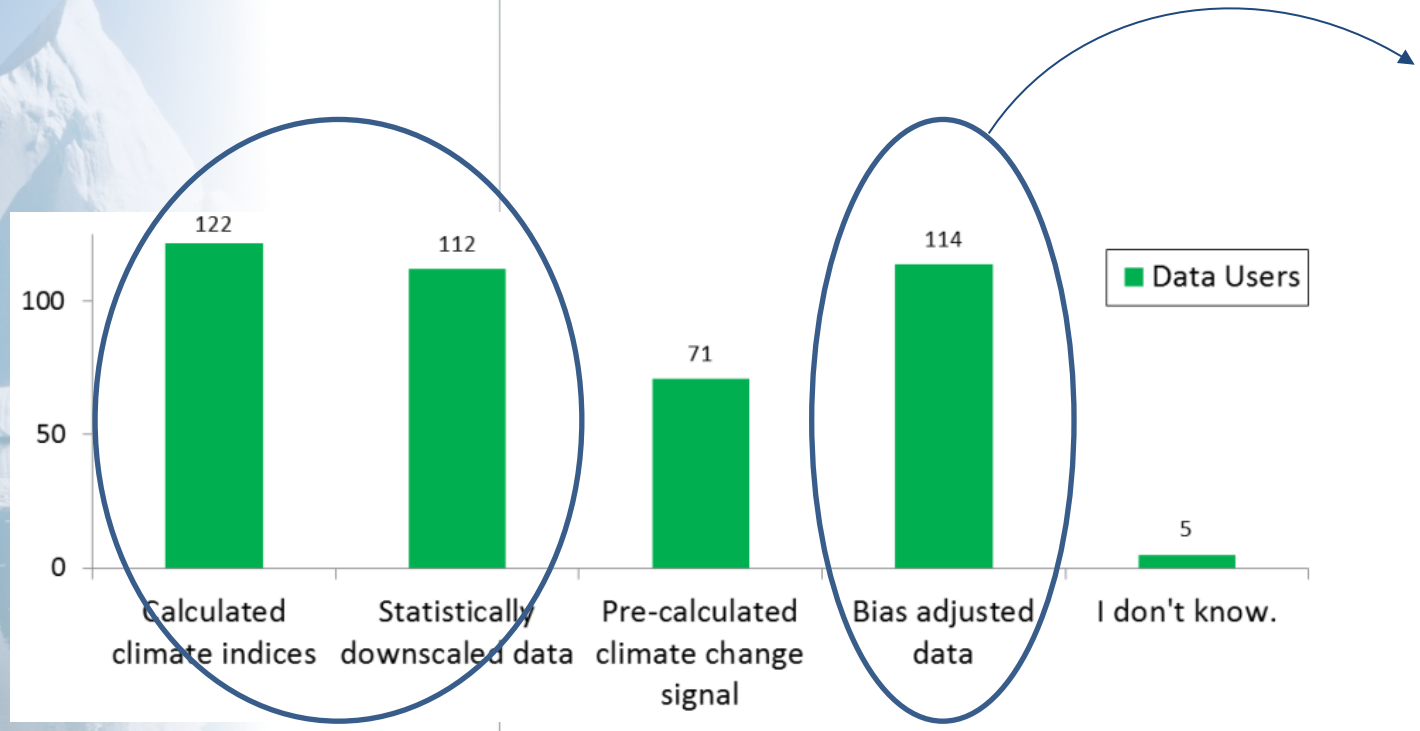
What type of post-processing data users would welcome?



CDS should optionally provide bias adjusted data, adjusted for different observational data and using different methods

Question of bias adjustment

- Especially impact models need bias adjusted (BA) data
- On ESGF BA data of Euro-CORDEX simulations exist → but it further reduces ensembe size
- It may introduce further uncertainty, since results depend on
  - (1) quality of observation
  - (2) calibration period
  - (3) different adjusting method
- Physical consistency between variables may damage

Information on quality

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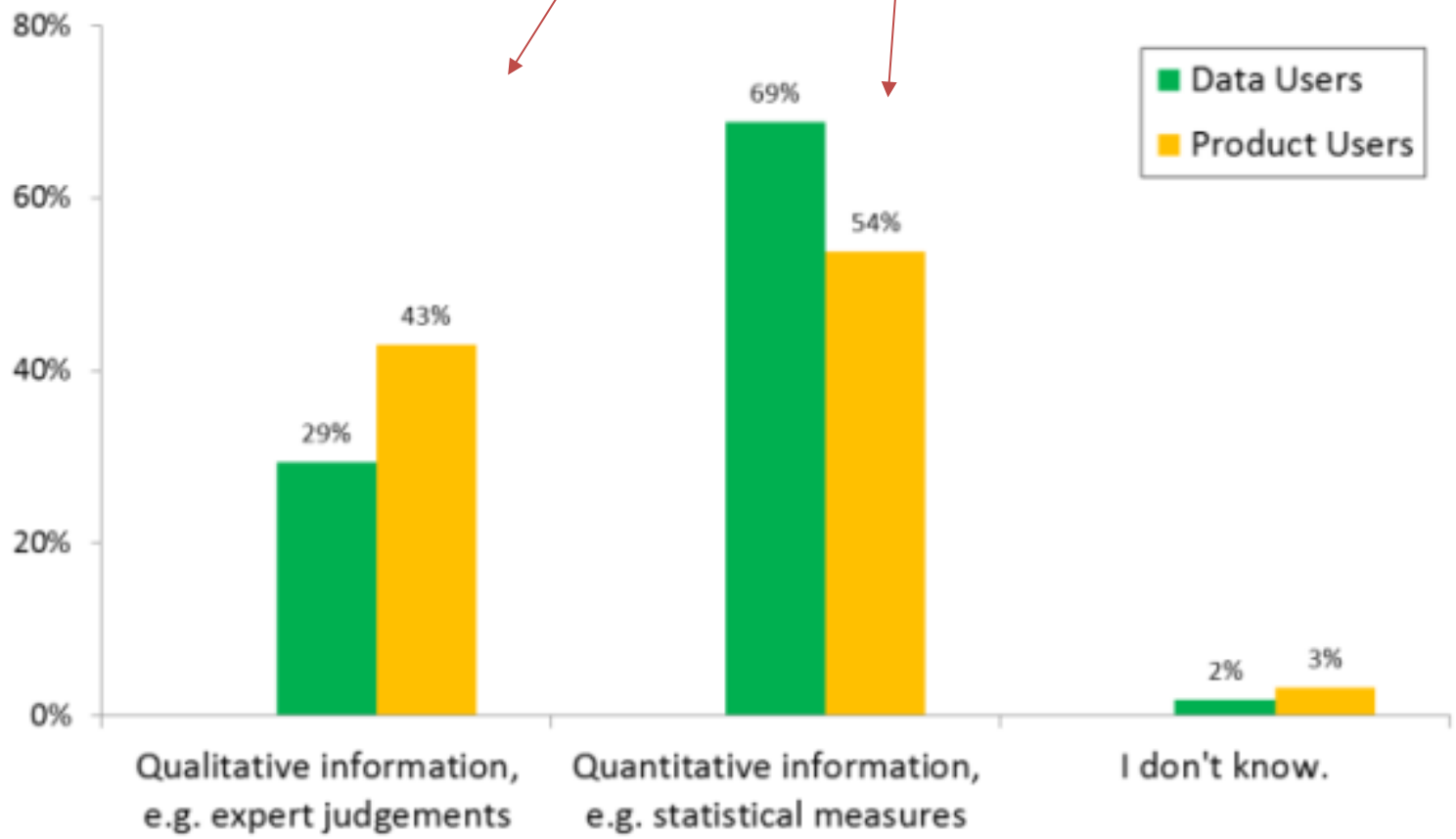
Qualitative / quantitative



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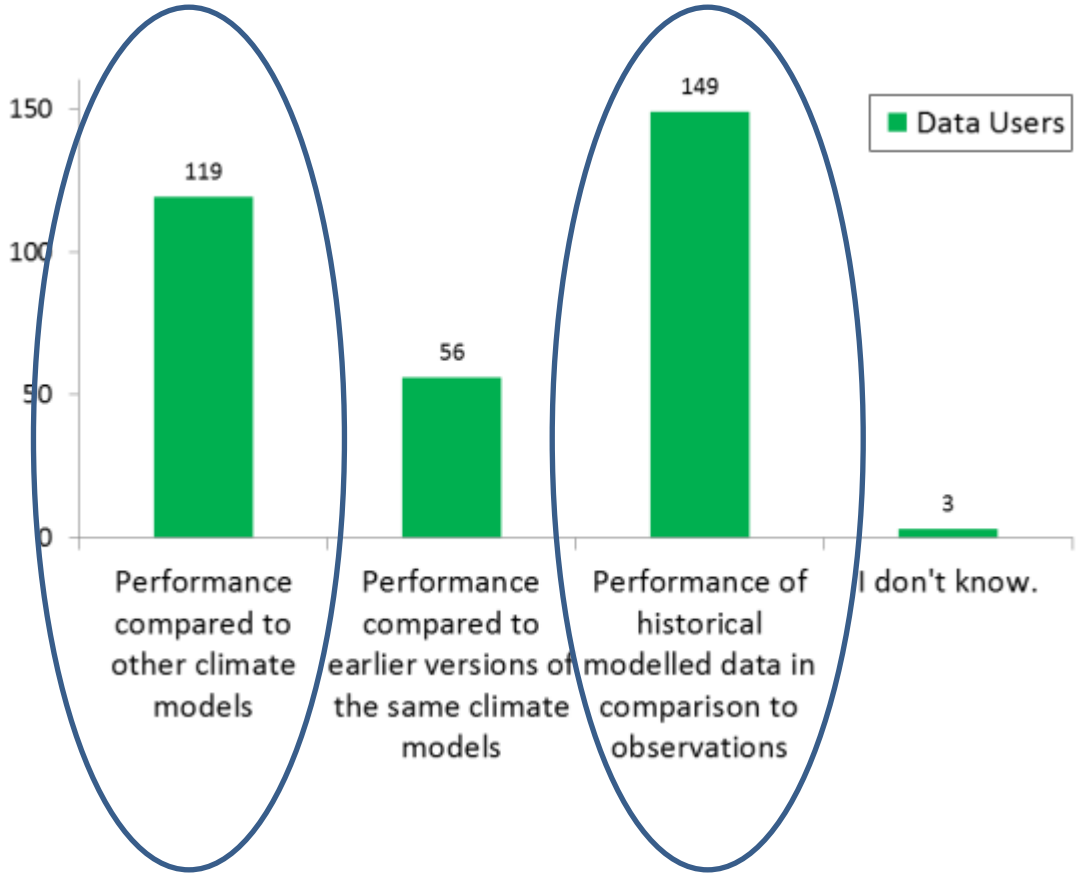
Information on quality

What is the preferred type of quality information?



Data users: 2 types dominate

- Performance against observation
- Performance against other climate models

Key question: how to measure quality?

- Model performance depends on examined variable, region, time period etc.

Performance metric should be carefully chosen considering the type and need of application

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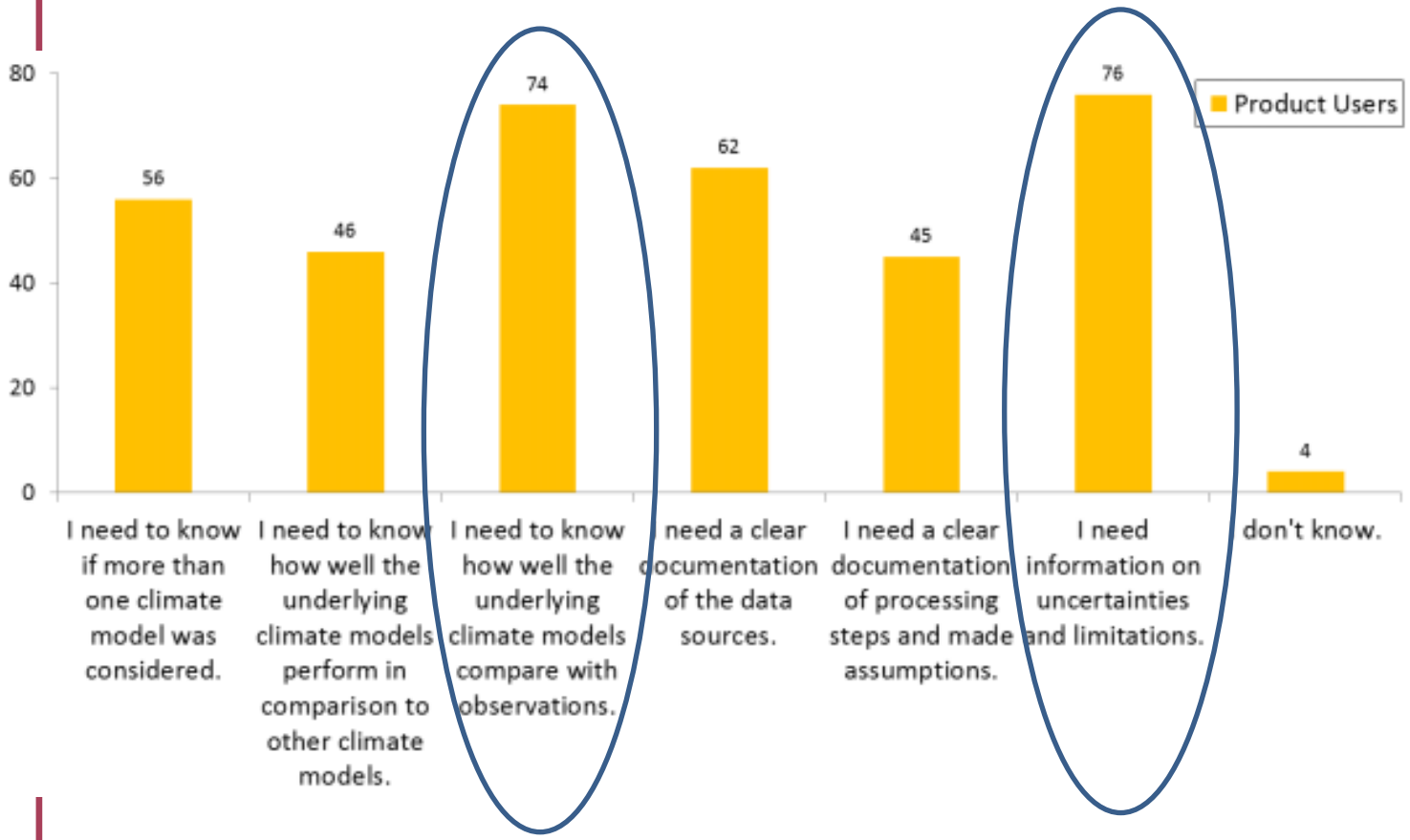
Information on quality

What is the preferred type of quality information?



Product users: no typical choices

2 answers reached 20% :

- Performance againsts observations
- Information on uncertainties and limitations

How this information should be delivered?

- Integrated into the product (e.g. hatching, including text, etc.)

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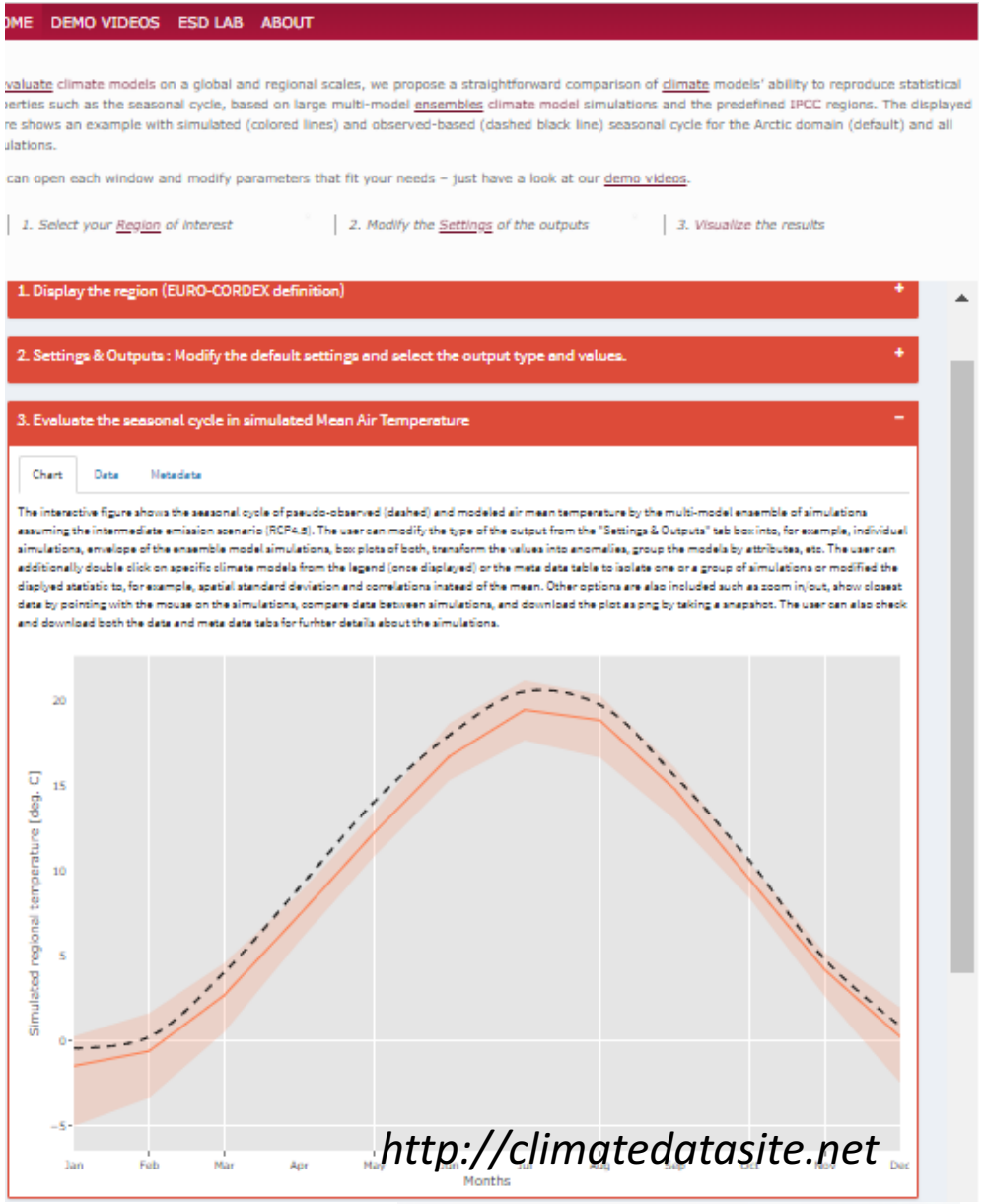
Goals for 2018

1st: collect feedback from users

- Feedback system will be set up
- Online and live demonstration
- Preparation of case studies
- Providing guidance for pilot tools



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Goals for 2018

2nd: preparation of Quality Assurance Template (QAT) for multimodel climate productions

QAT provides a summery of each entry in the CDS catalogue on

- Reference
- Documentation
- Data performance metrics
- Uncertainty information
- Provide independent assessment

Key questions on QAT

1. Is there a way for a common QAT?
2. How to define entry?: variable / simulation / result of user retrieval (e.g. variables for a specific region, etc.)
3. What type of data performance metrics be used?
   - general
   - + DECM's advise: use different metrics for different applications (applications should be grouped)
4. How to define uncertainty?
   - Comparing to the ensemble? To which ensemble?

Thank you very much for your attention!

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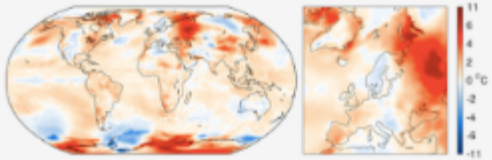

Average surface air temperatures for August 2016

August 2016

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