ClimatEurope WP4-D4.1 Webinar
16 November 2016

Linking climate modelling research infrastructure & climate services

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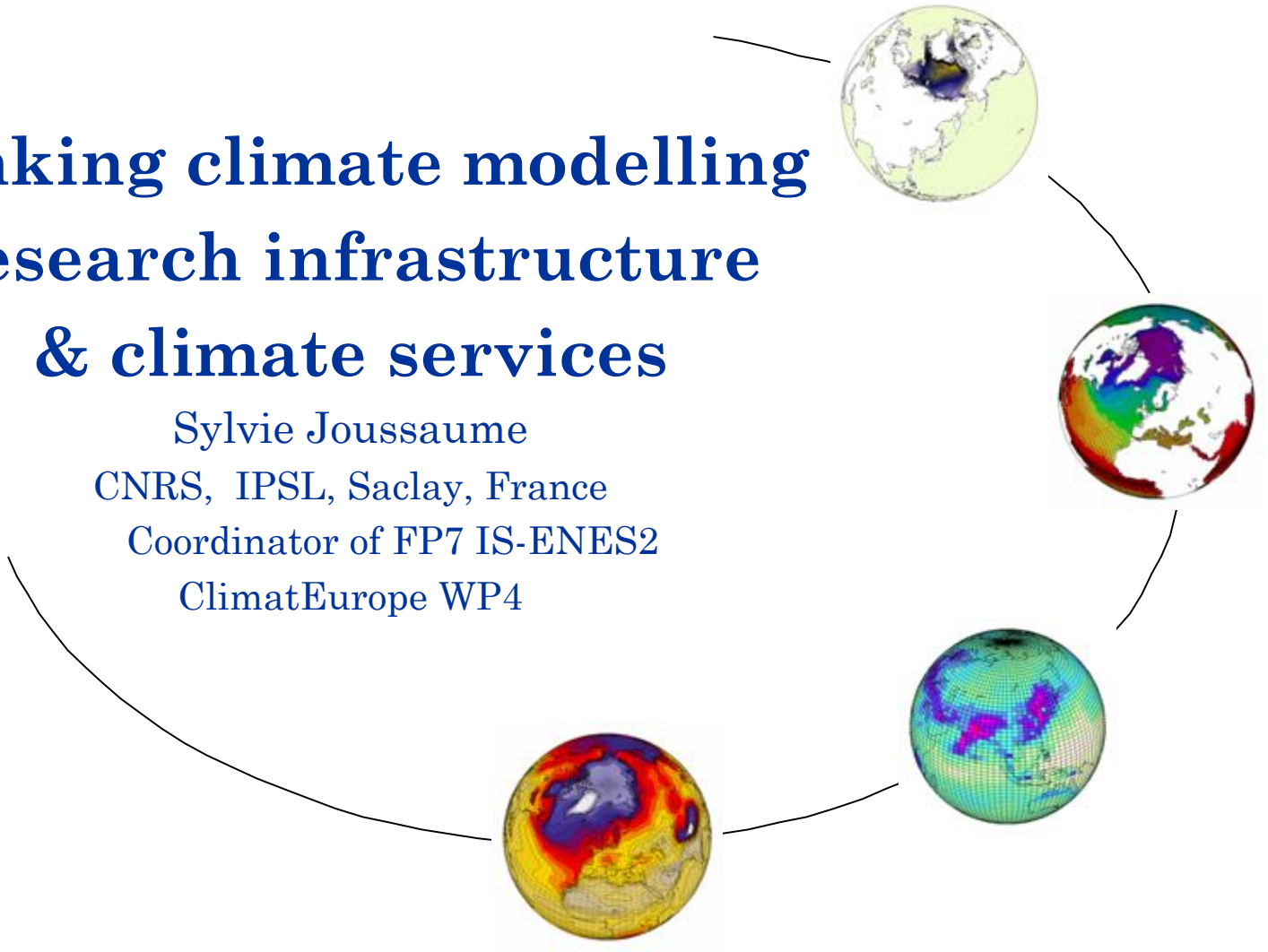
ClimatEurope WP4



IS-ENES : Infrastructure for ENES

enes EUROPEAN NETWORK FOR EARTH SYSTEM MODELLING

http://enes.org/

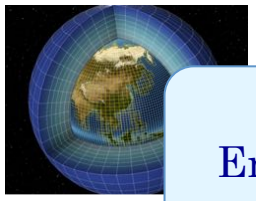
is-enes INFRASTRUCTURE FOR THE EUROPEAN NETWORK FOR EARTH SYSTEM MODELLING

http://is.enes.org/

1rst phase: March 2009- Feb 2013

2nd phase: Apr 2013- March 2017

« Integrating Activities »



Climate models

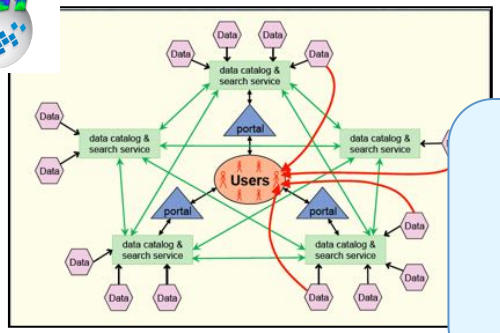
Environment software tools

ESM ca 1000 man years

High-performance computers

& storage facilities

Earth System Grid Federation ESGF



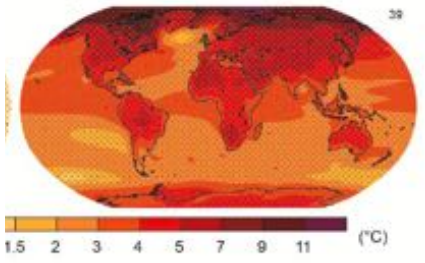
Data & metadata

Standards

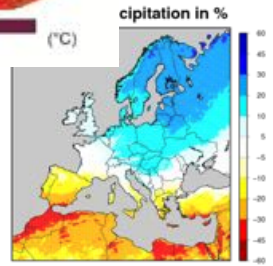
Distributed database ESGF

10 000 registered users worldwide

Open access



« Reference Simulations »



Climate research & Impact research

Climate services

Support WCRP international coordinated experiments

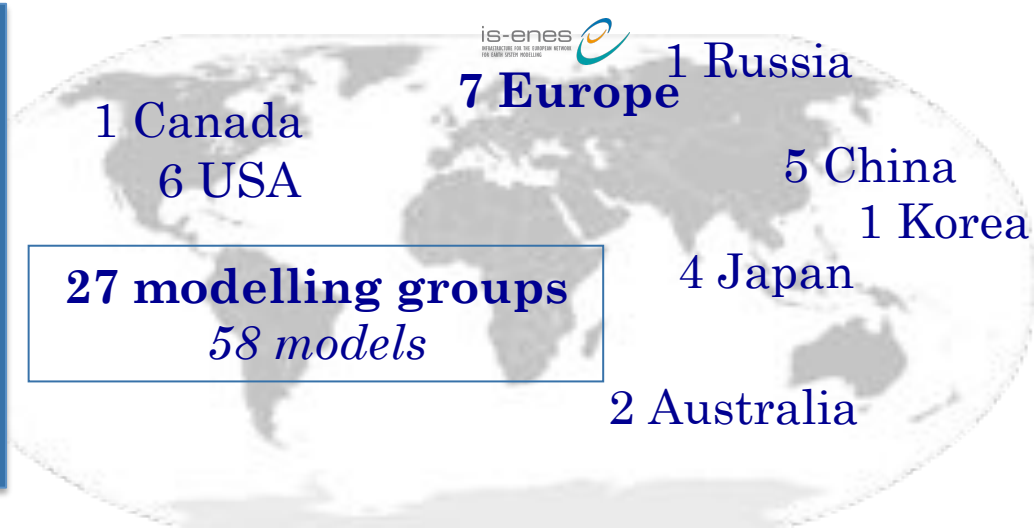
Used in IPCC Assessments Reports

WCRP World Climate Research Programme

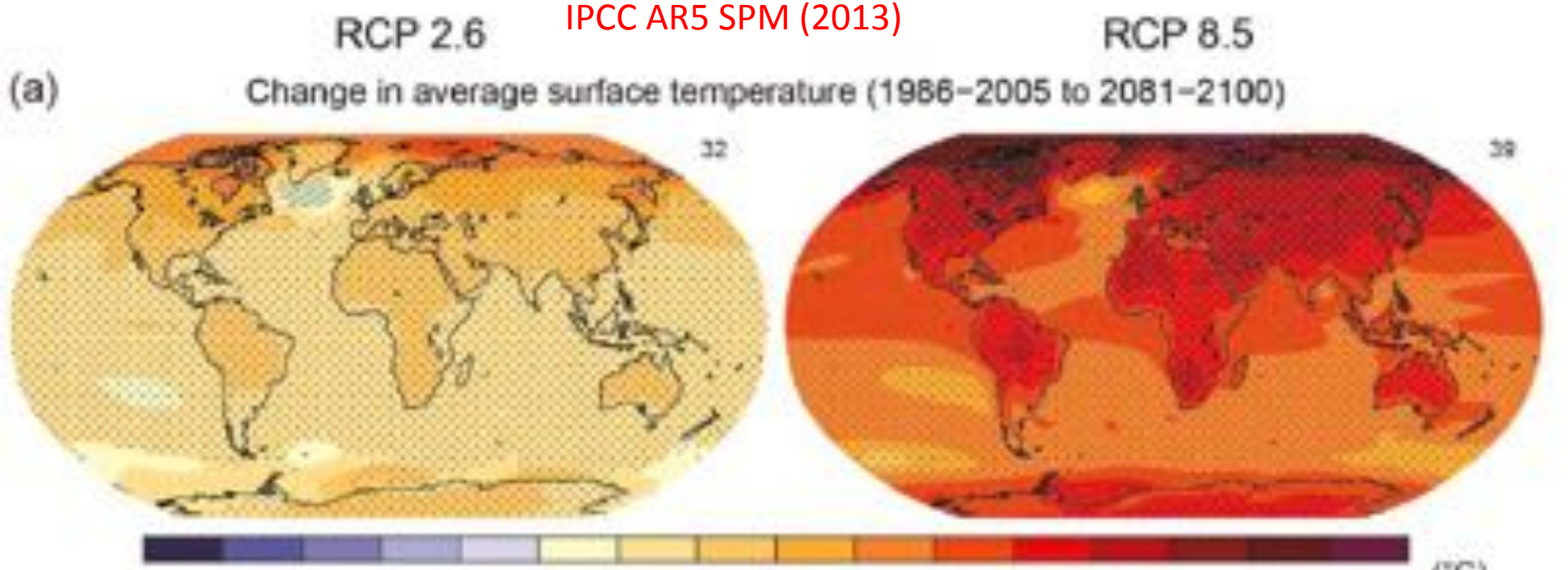
CMIP5 international coordinated experiments « Reference simulations »

Evaluate/Understand/Projections

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

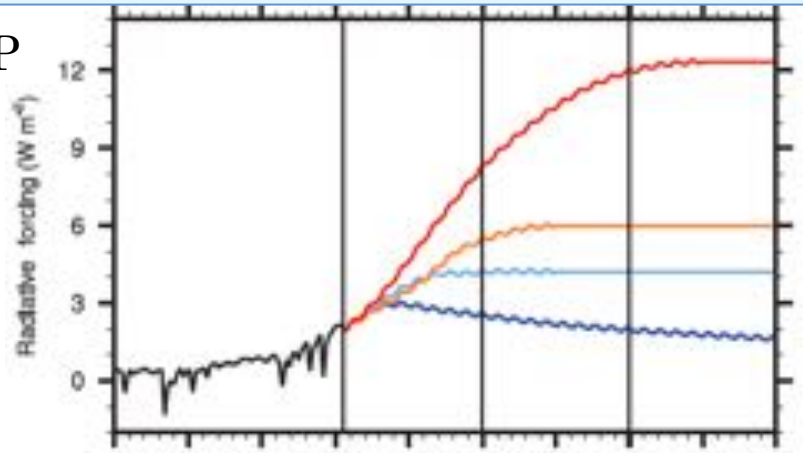


IPCC AR5 SPM (2013)

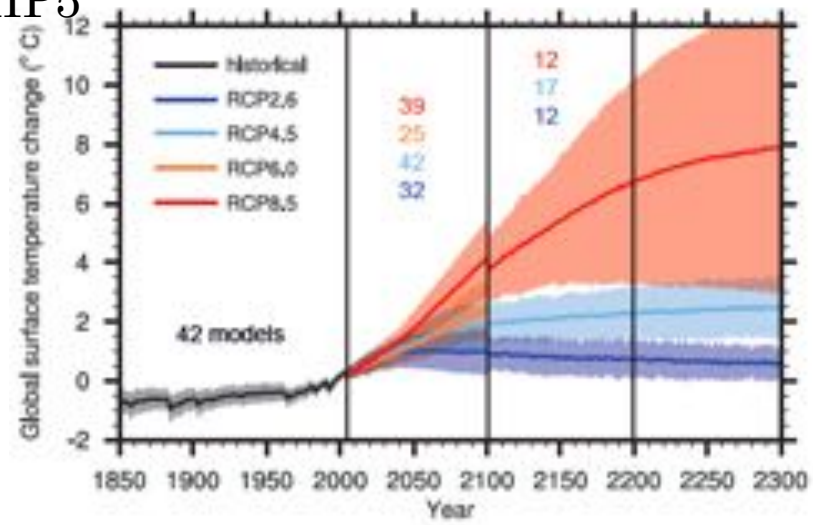


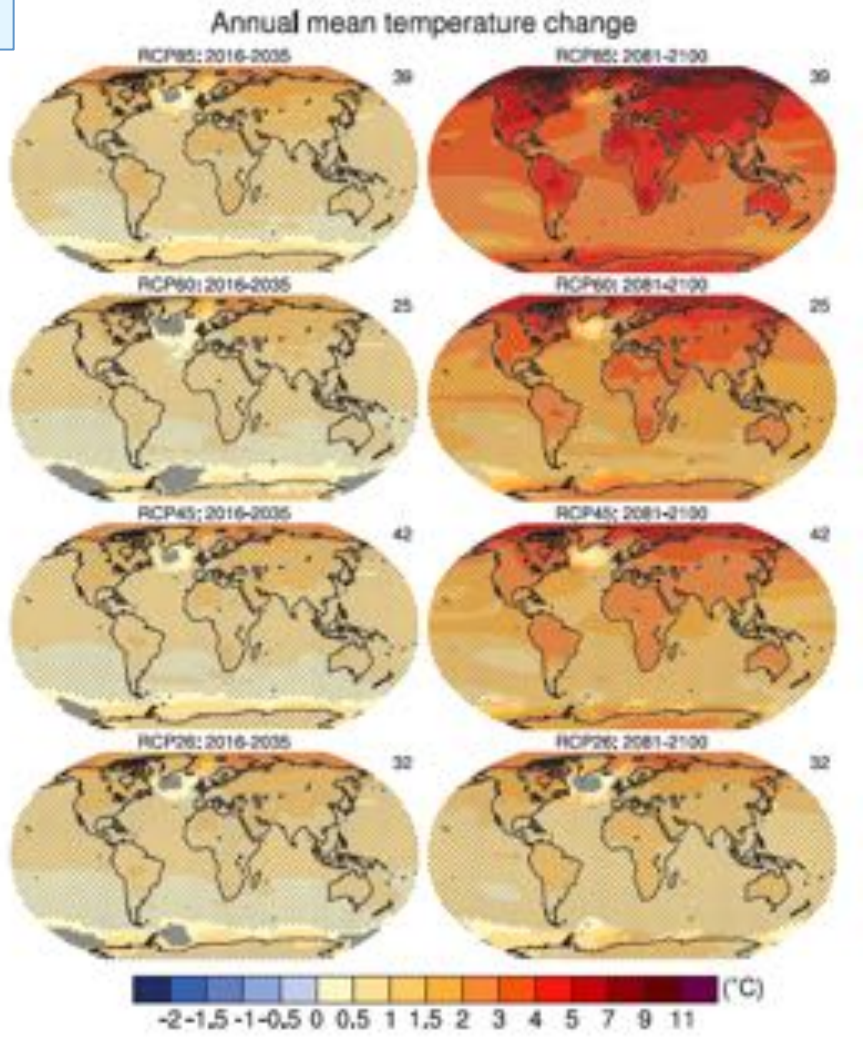
Projections of future climate change

RCP



CMIP5





IPCC AR5 TS (2014)

	Scenario	2046–2065 Mean	2046–2065 *Likely* range[c]	2081–2100 Mean	2081–2100 *Likely* range[c]
Global Mean Surface Temperature Change (°C)[a]	RCP2.6	1.0	0.4 to 1.6	1.0	0.3 to 1.7
	RCP4.5	1.4	0.9 to 2.0	1.8	1.1 to 2.6
	RCP6.0	1.3	0.8 to 1.8	2.2	1.4 to 3.1
	RCP8.5	2.0	1.4 to 2.6	3.7	2.6 to 4.8

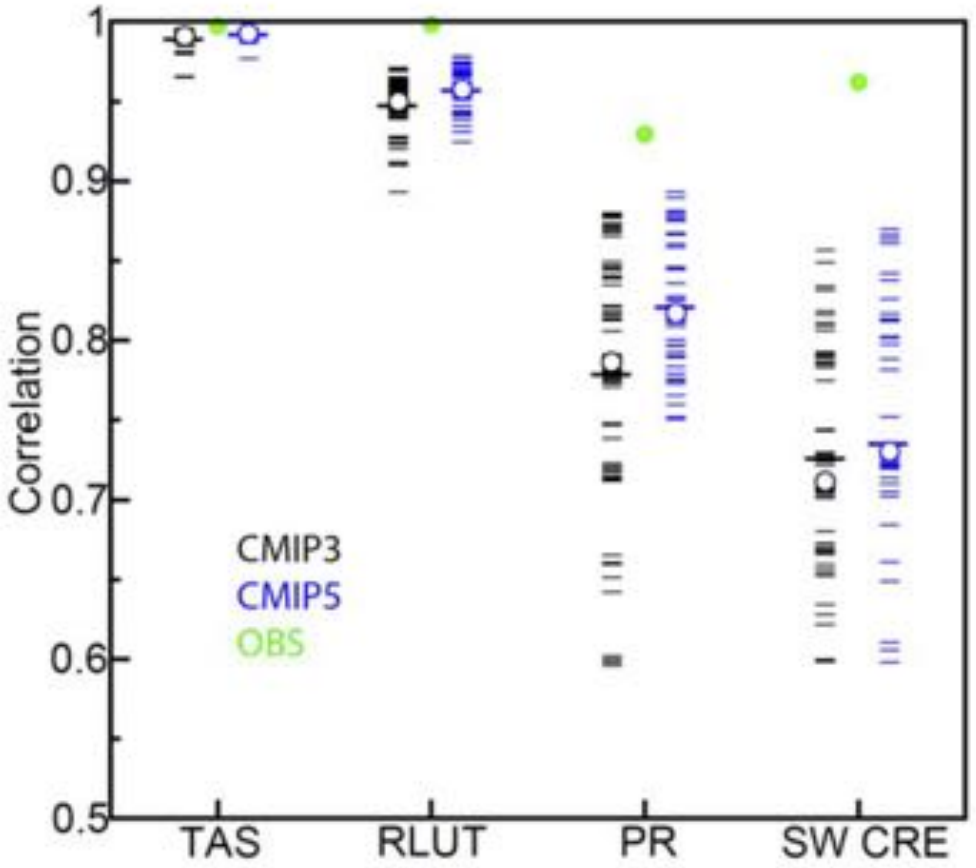
Model evaluation

Pattern correlations between models and observations
Annual 1980-1999

Ensemble mean

Median

IPCC AR5 WGI, Ch 9



Models ca 2005
CMIP3

Models ca 2012
CMIP5

Surface air temperature

Precipitation

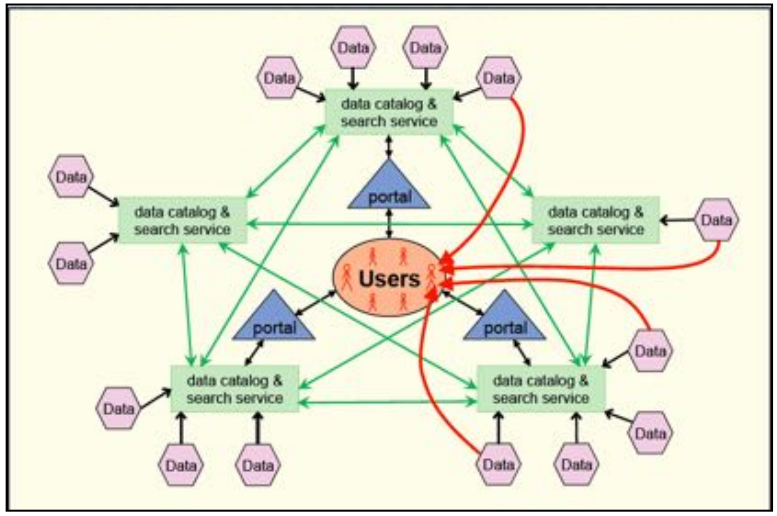
LW outgoing radiation

SW cloud radiative effect

OBS other set of observations

A common infrastructure distributed database & standards

CMIP5: 2 PB



Adoption of common standards/ conventions for the:

Structure and format of climate data

Metadata used to describe climate data

Vocabulary used for categorizing the diversity of model output

& Documentation of Model/experiments **(ES-DOC)**

Standardization enables/facilitates

Automation in the preparation of model output

Analysis by researchers using uniform methods for reading and interpreting data

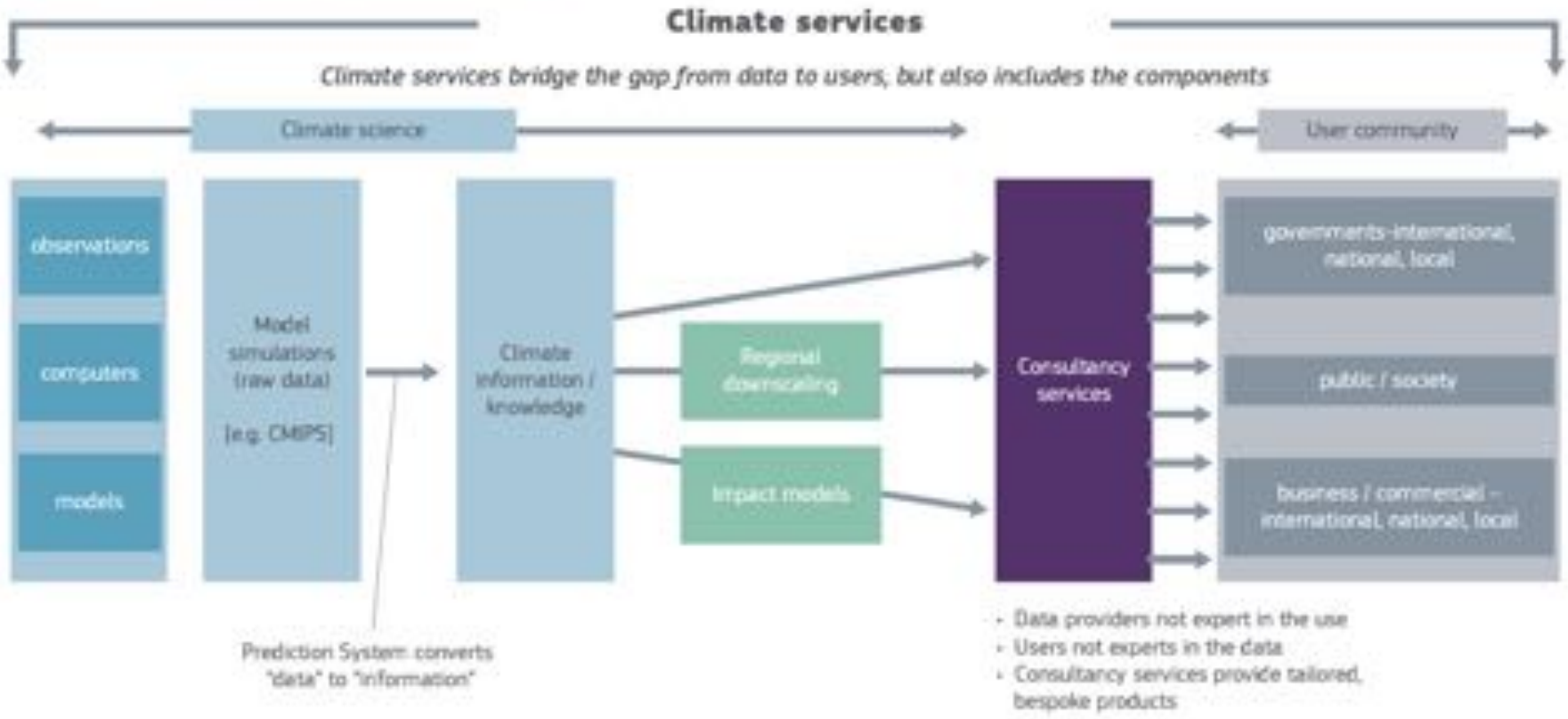
Unique identification of files

Sharing of data across the ESGF network

Ref: from Doutriaux and Taylor, 4th ESGF meeting, 12/2014

A European Research and Innovation Roadmap for Climate Services (2015)

Figure 1. The Essence of Climate Services



Which challenges are raised for the climate modelling research infrastructure by climate services ?

Data & metadata

Existing RI
- Common standards for data and metadata
- Quality control of data

Needed for CS:
- Sustained reliable service
- Tools to facilitate usage
- Compute facilities for indicators

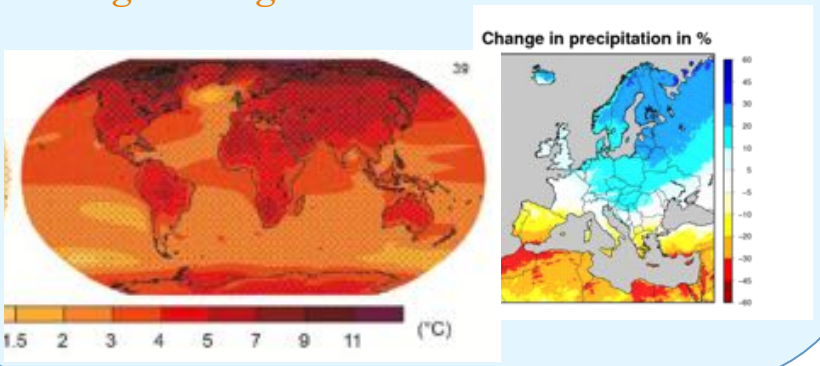
Added Value for research:
- Integration of models and observations
- Consistent standards with predictions
- Support further developments

CMIP Reference simulations

Existing RI:
- Multi-model, scenarios, ensembles
- Well-evaluated

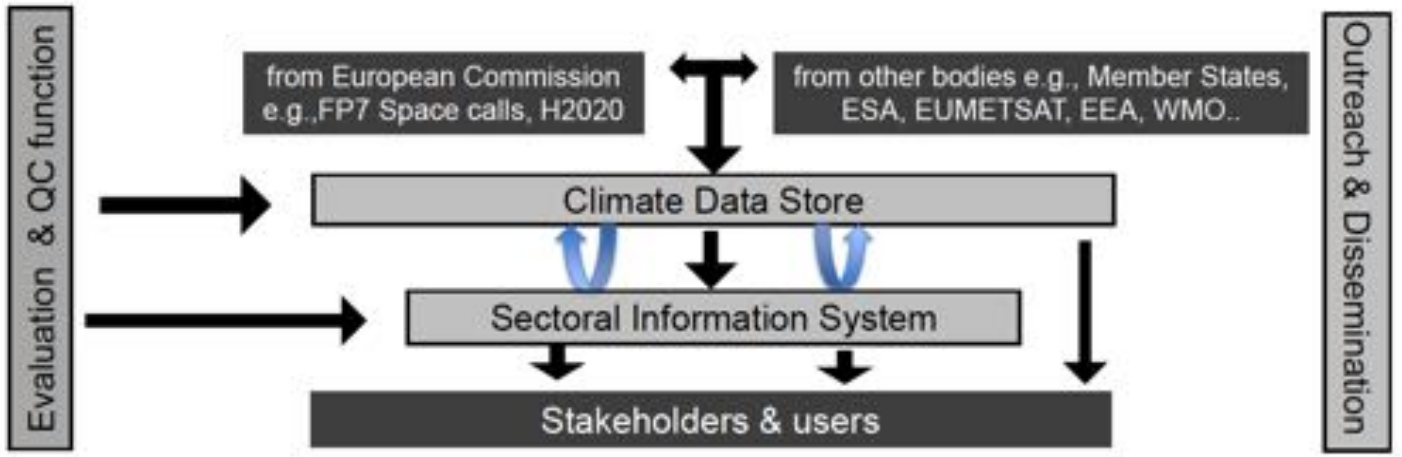
Needed for CS:
- Larger range of scenarios & ensembles
- Larger set global/regional projections
- bias corrected & guidance

Added value for research:
- Better quantification of uncertainties
- Larger range of users



Copernicus
Climate Change Service
C3S
at ECMWF

Funded by
the European Union



Climate Data Store

Reanalyses
Satellite data (ESA CCI)
Seasonal Forecasts
Projections (Global/Regional)

CLIPC: Climate Information Portal for Copernicus

Precursor project
Based on ESGF

Global projections : broker on ESGF

Lot 1: ESGF node for C3S (BADC, DKRZ & IPSL)
Lot 2: Multi-model product generation (in negotiation)
Lot 3: Roadmap towards a reference set of climate projections (MetOffice, with IPSL)

Regional projections (on-going tender)

Lot 1: Access to CORDEX data
Lot 2: Set of regional simulations for Europe

CLIPC Copernicus precursor project & IS-ENES

is-enes
INFRASTRUCTURE FOR THE EUROPEAN NETWORK FOR EARTH SYSTEM MODELLING

ESGF
Ob4mip
Ana4MIP

Model evaluation
Input to model
Downscaling

Process studies

ENES Infrastructure (IS-ENES)
Model development & simulations
Access to model data (ESGF)

Climate4impact.eu

Feedbacks

Climate forcing

Observations
Climate
Earth System

from
Satellite
In situ
Campaigns

Reanalyses

Climate Impact communities
Impact models, impact indicators

CLIPC
Climate Information Portal

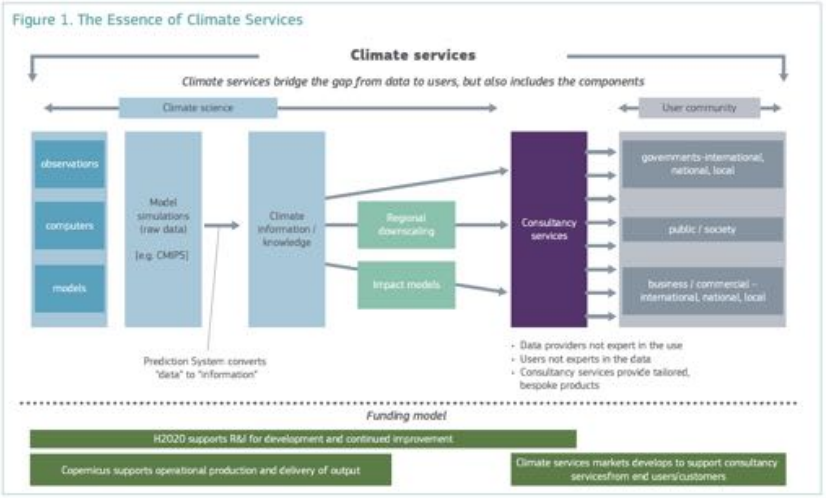
Climate Information Portal for Copernicus (2013-2016)

Climate Services (C3S)

climateurope
Linking science and society

How to manage the situation with the H2020 work programme where climate services show a tendency to be better funded than climate observations, model development and infrastructure?

- **Climate services as an overall chain**



- **Need to support climate science: better understanding, prepare future climate services, improve models, sustain infrastructure**

SWOT analysis: research infrastructure (RI) & climate services (CS)

Strengths

CMIP:
Better ensemble mean, range of uncertainty, well evaluated, source for downscaling, computation of various indicators

Data Infrastructure:
common database with common standards for data & metadata
CLIPC precursor project

Assets for climate services

Weaknesses

CMIP:
Limited set of scenarios, Better at large regional scale (>2000 km), need for downscaling & bias corrections

Data Infrastructure:
Distributed, project funded

Opportunities

Climate services (CS) as users:

Strong added value, wider impact
Better integration with observations & predictions: also serving research
Possible private funding by CS users

Threats

Climate services (CS) as users:

CMIP not answering CS needs
Sustaining funding support (for RI)
Difficulty to support climate science
Insufficient reliability of RI for services
Int. Governance (independent of CS)