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

Copernicus C3S Climate Data Store Workshop
3-6 March 2015
Reading

European climate modelling infrastructure: Accessing climate projections

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Institut Pierre Simon Laplace
Max-Planck-Institut für Meteorologie
CERFACS
DKRZ
National Centre for Atmospheric Science
The University of Manchester
DMI Vejr, klima og hav
Science & Technology Facilities Council
cmcc Centro euro-Mediterraneo sui Cambiamenti Climatici
Met Office
Royal Netherlands Meteorological Institute Ministry of Transport, Public Works and Water Management
METEO FRANCE Toujours un temps d'avance
IC3
SMHI
BSC
WAGENINGEN UR For quality of life
INHGA
DLR
Meteorologisk institutt met.no

IS-ENES : Infrastructure for ENES

FP7 project « Integrating Activities »

http://enes.org/

http://is.enes.org/

1rst phase: March 2009- Feb 2013, 18 partners
2nd phase: Apr 2013- March 2017, 23 partners

Infrastructure
Models & their environment
Model data (ESGF)
Interface with HPC ecosystem

Users :
Climate modelling community
(Global & regional)
Impact studies

Support to international databases : for **IPCC AR5**
CMIP5 & CORDEX (EuroCordex, Africa)

Support to JPI Climate research agenda

WCRP World Climate Research Programme

Networking, Service & Joint Research Activities

Support to international coordinated experiments CMIP5

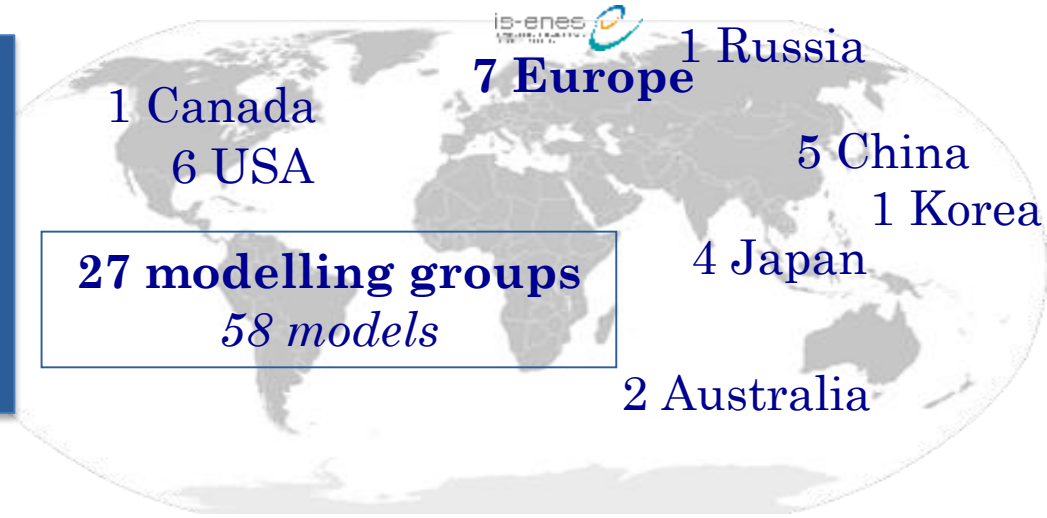
Evaluate/Understand/Projections

3400 simul. yrs up to > 12000 yrs

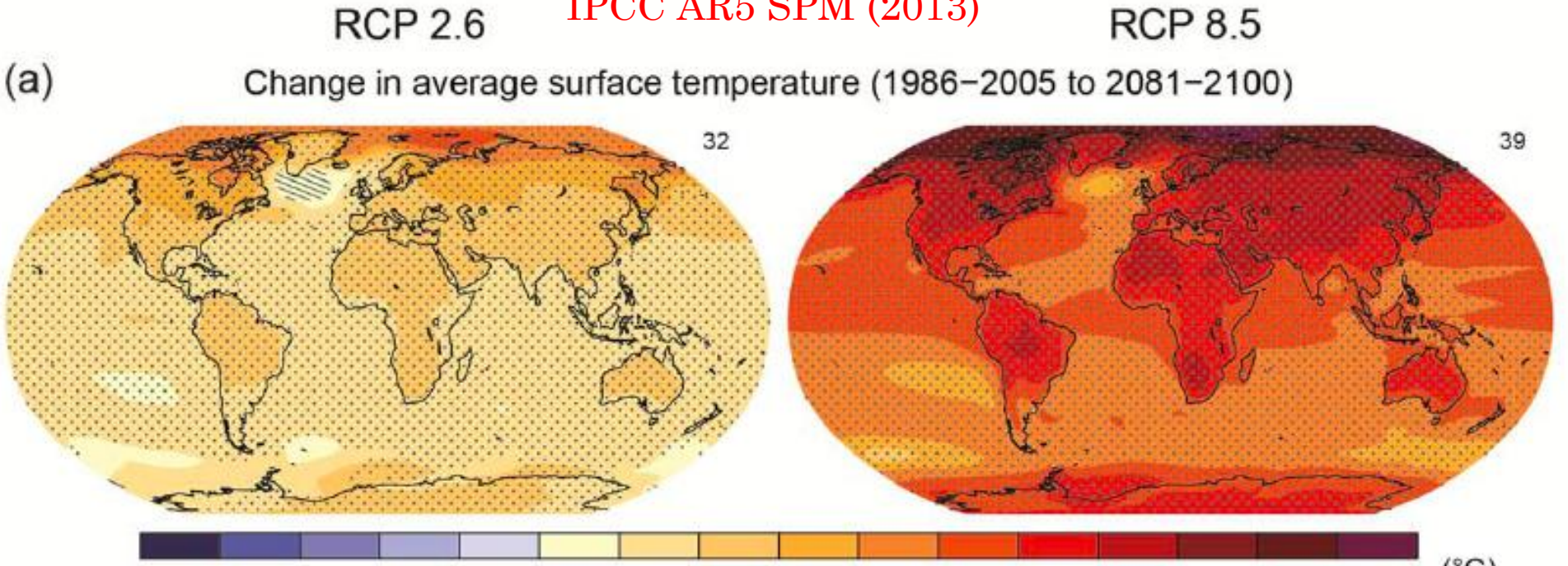
50 expts up to > 160 expts

CMIP5: 1000 – 3000 Tbytes

(CMIP3: 36)



IPCC AR5 SPM (2013)



CMIP international data bases

Ease access for model analysis and impact studies

CMIP3

36 TB

Central archive at PCMDI (LLNL)

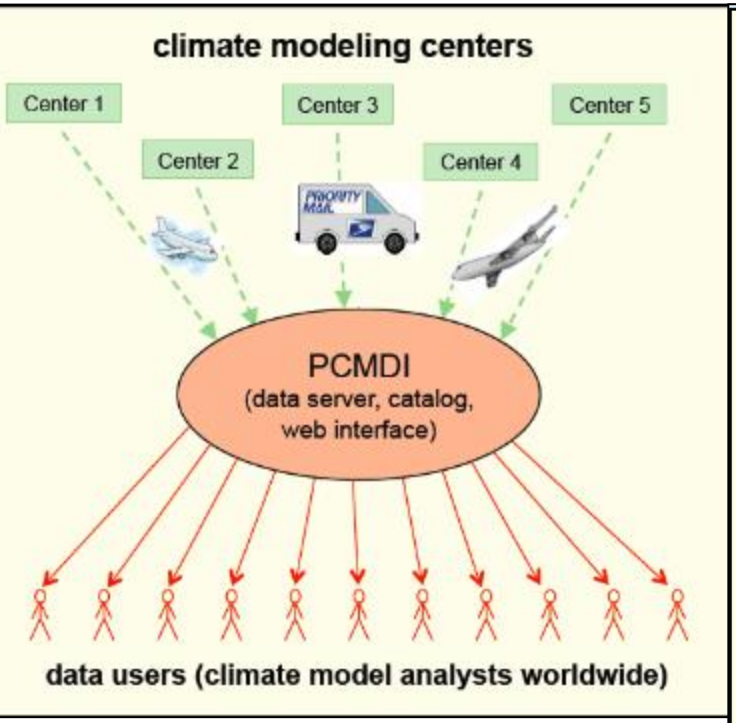
Earth System Grid

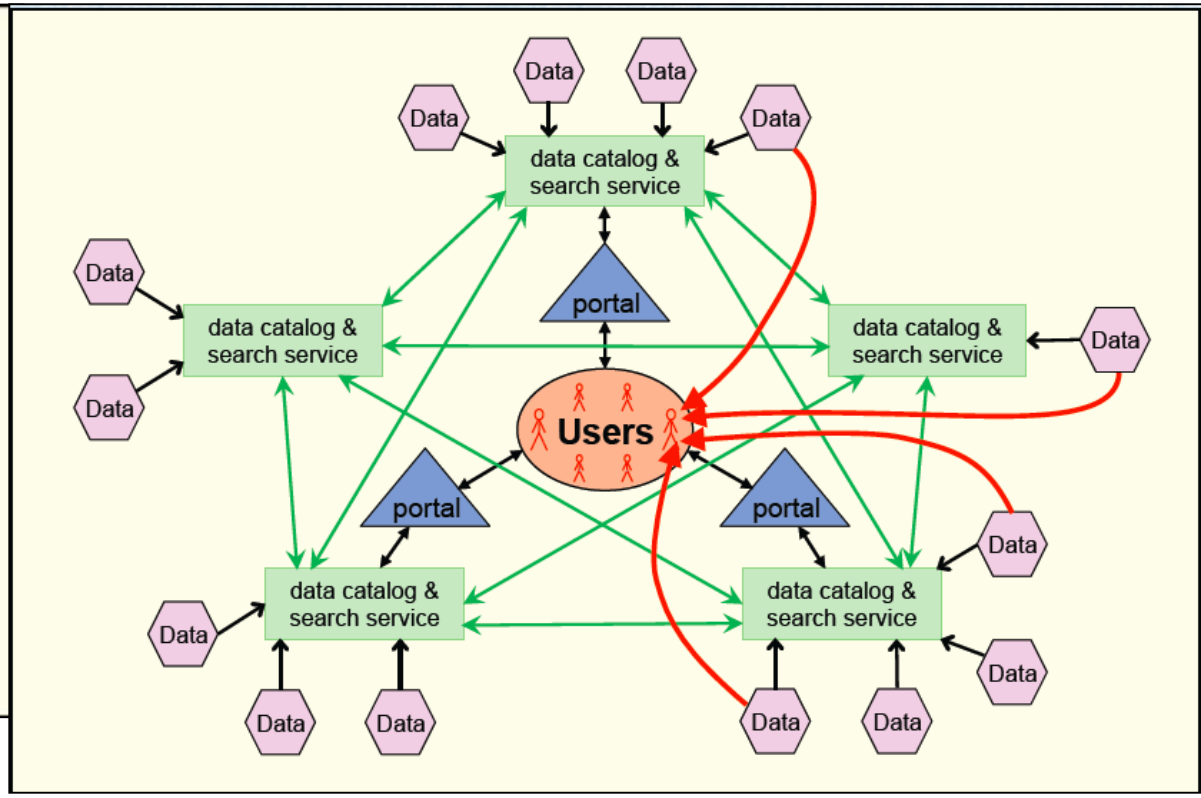
CMIP5

1.8PB (up to 3 PB)

Distributed data infrastructure

Earth System Grid Federation

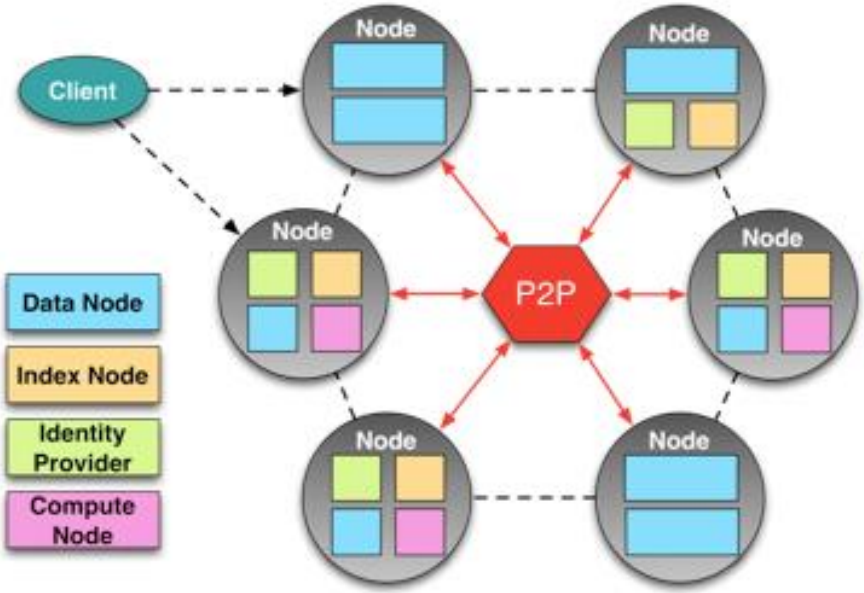


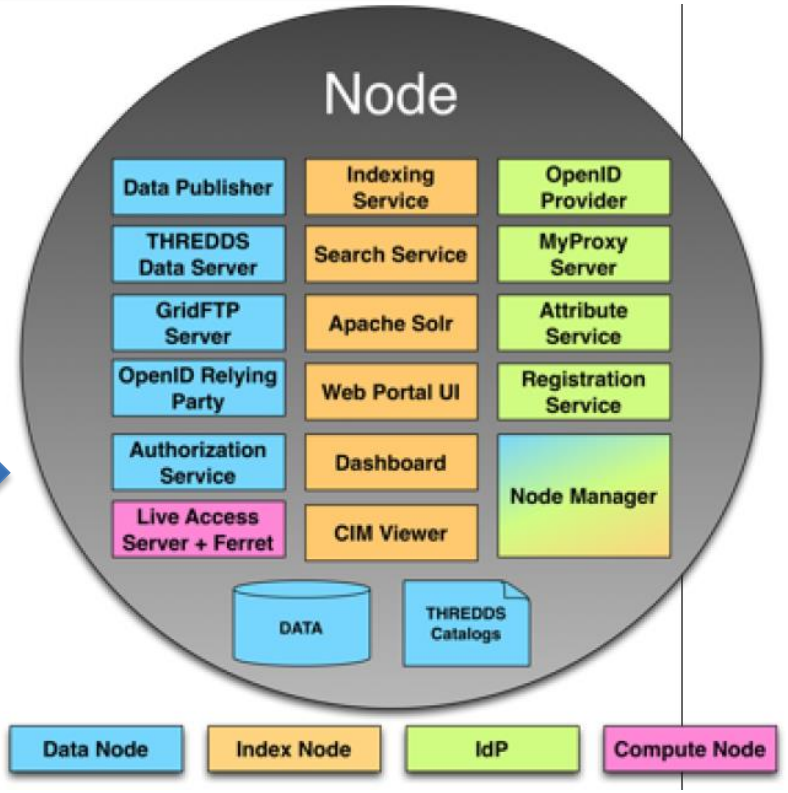


Courtesy K. Taylor (PCDMI)

Earth System Grid Federation

ESGF
Earth System Grid Federation





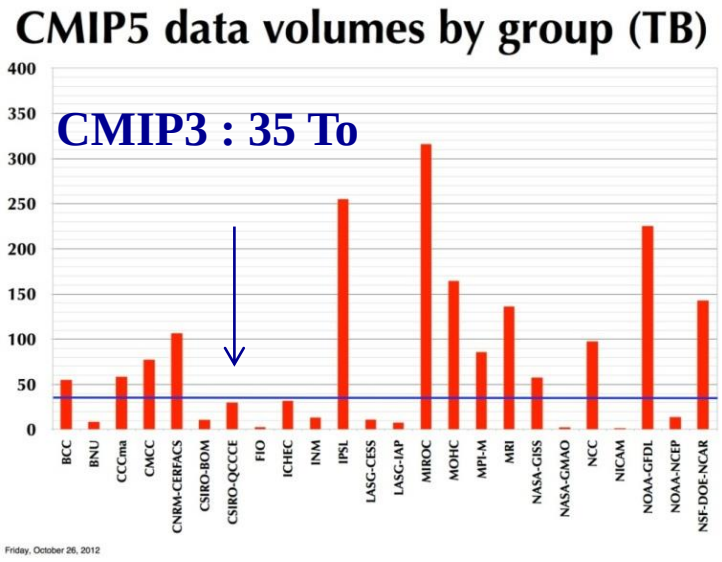
Open source software
International
Community led : GO-ESSP, WIP
Multi-agencies support
DOE, NOAA, NASA, IS-ENES, NCI

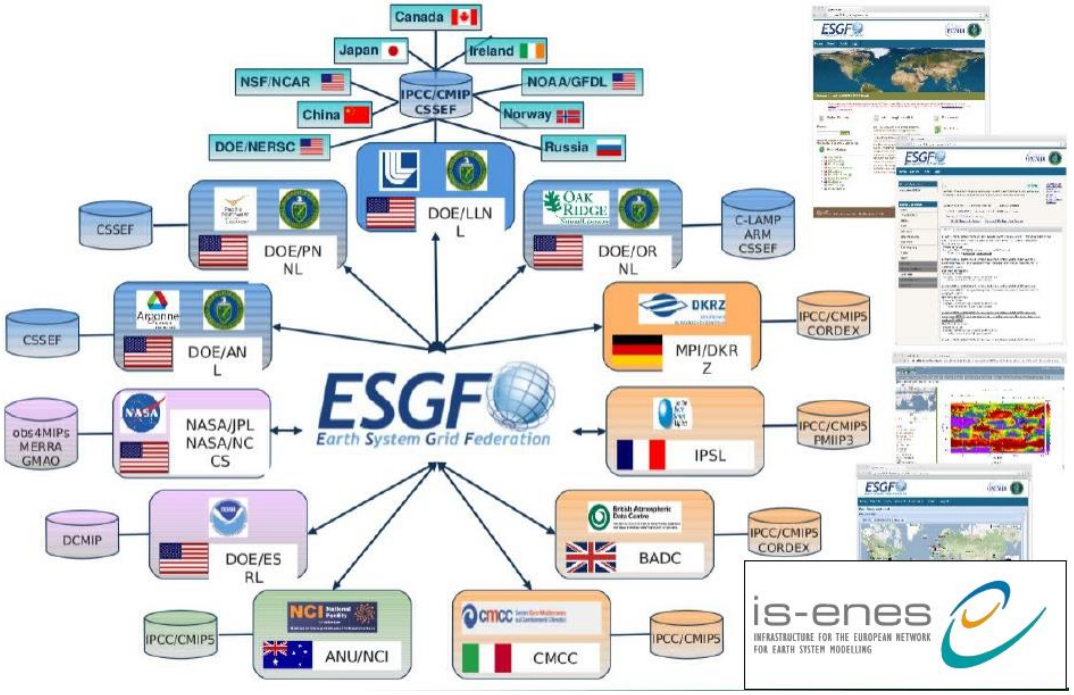
Earth System Grid Federation

CMIP5
2 PB of data
59 000 datasets
4.5 million files

Open access
Registration required
Very few restrictions
for commercial use

Model outputs (CMIP and others)
Observations for model evaluation (Obs4MIP)
Reanalyses (ana4MIP)





ESGF worldwide system

Data nodes
up / **down**

Replicas allow
full time access

ESGF Dashboard (CMCC)

ESGF Users
eg IPSL data node

ca 10 000 registered users
ca 30 TB/mth/node transfer

Standards

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

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

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

netCDF

CF Conventions – provides for standardized description of data contained in a file

Data Reference Syntax (DRS) – defines vocabulary used in uniquely identifying MIP datasets and specifying file and directory names

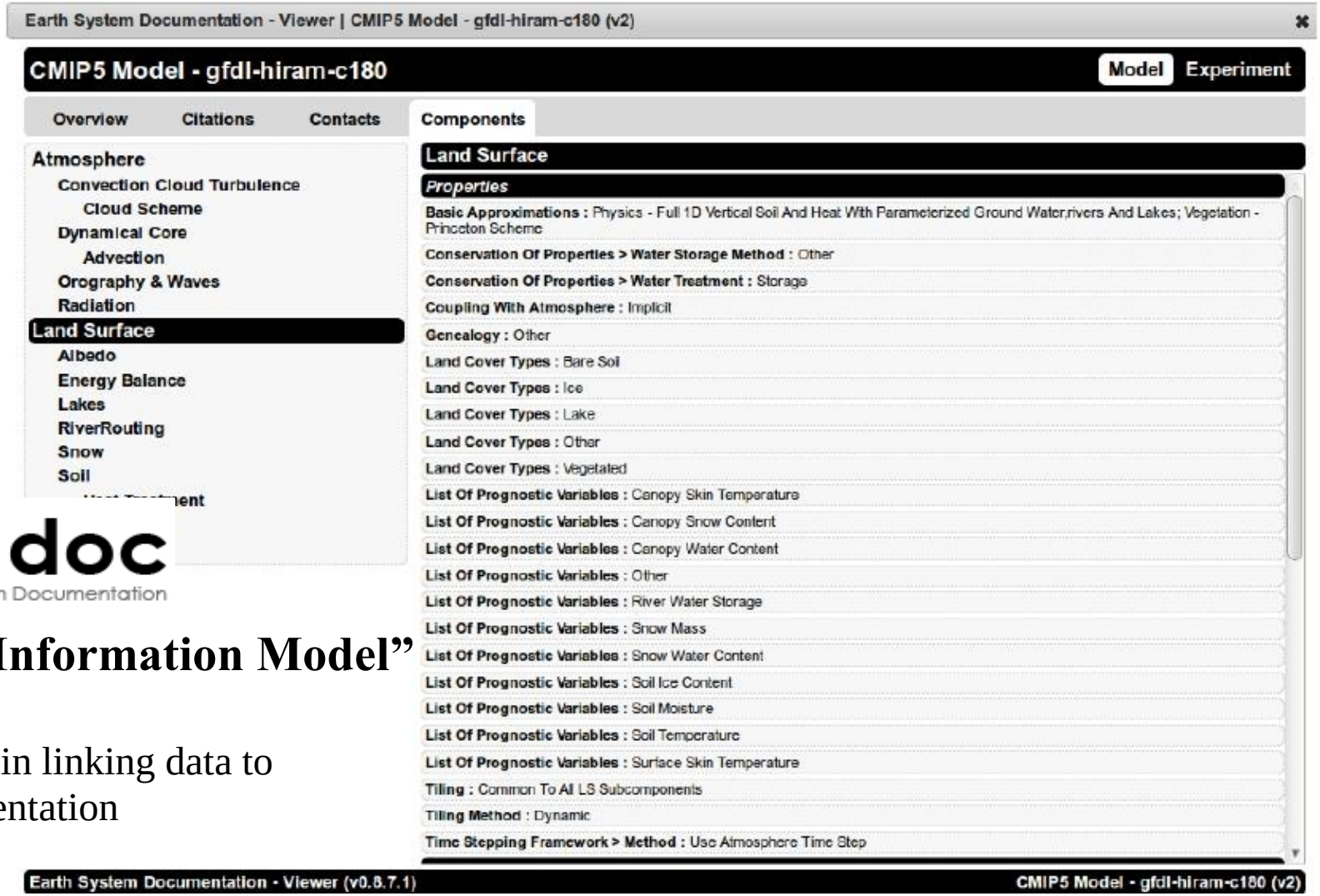
CMIP output requirements – specify the data structure and metadata requirements for CMIP data

CMOR (Climate Model Output Rewriter) developed at PCMDI (fromCMIP3) translation into the standard form

IPCC AR5 variable counts

	1 hour	3 hour	6 hour	daily	month	annual	**totals**
aerosol	0	0	0	0	81	0	**81**
atmosphere	75	101	9	86	184	0	**455**
land	0	3	0	2	59	0	**64**
land ice	0	0	0	2	13	0	**15**
ocean	0	1	0	3	116	0	**120**
biogeochemistry	0	0	0	0	88	71	**159**
sea ice	0	0	0	4	47	0	**51**
totals	**75**	**105**	**9**	**97**	**588**	**71**	**945**

CMIP5 – Browse Metadata on models and experiments



es-doc
Earth System Documentation

"Common Information Model"

Javascript plugin linking data to remote documentation

metafor

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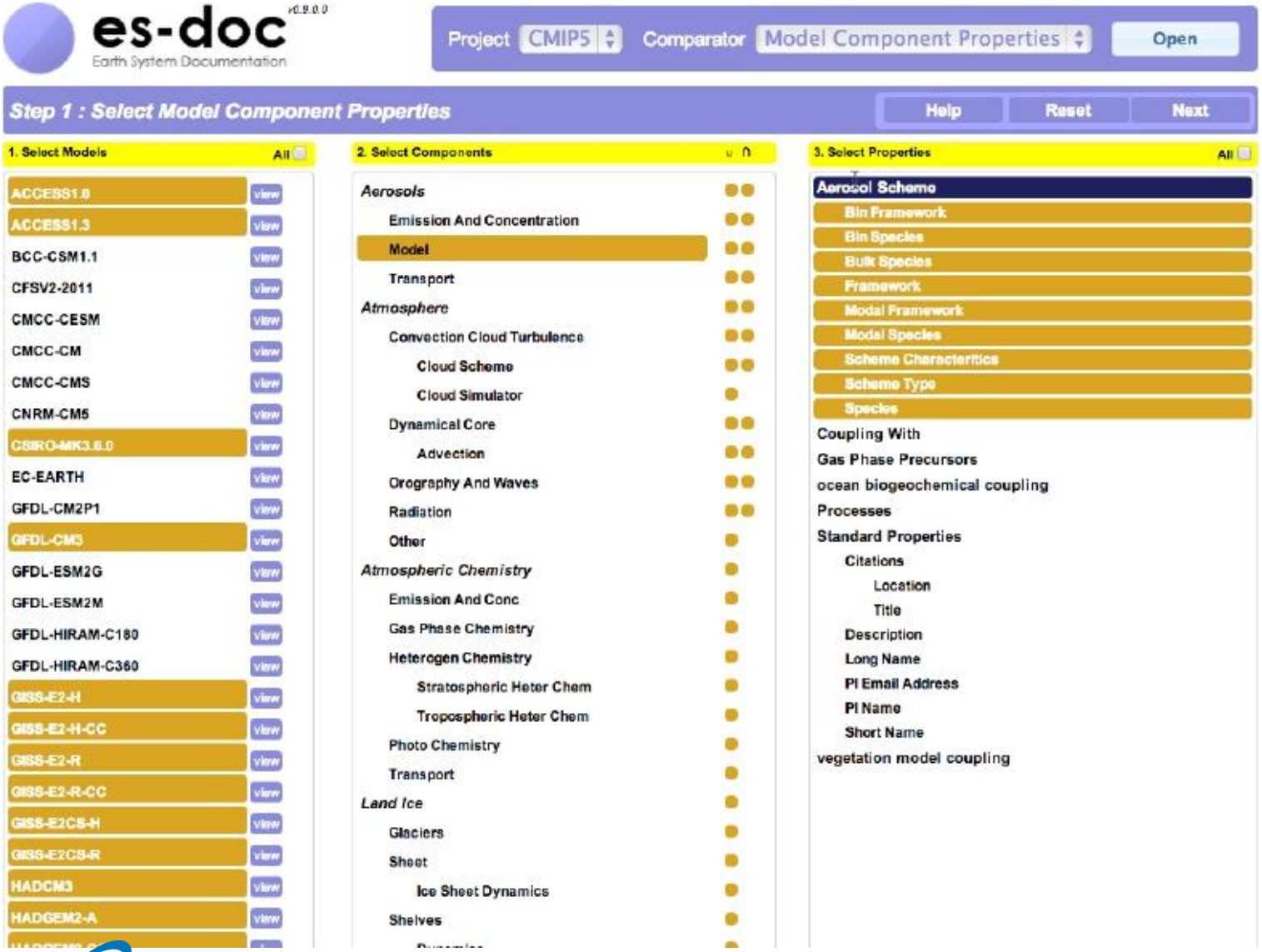
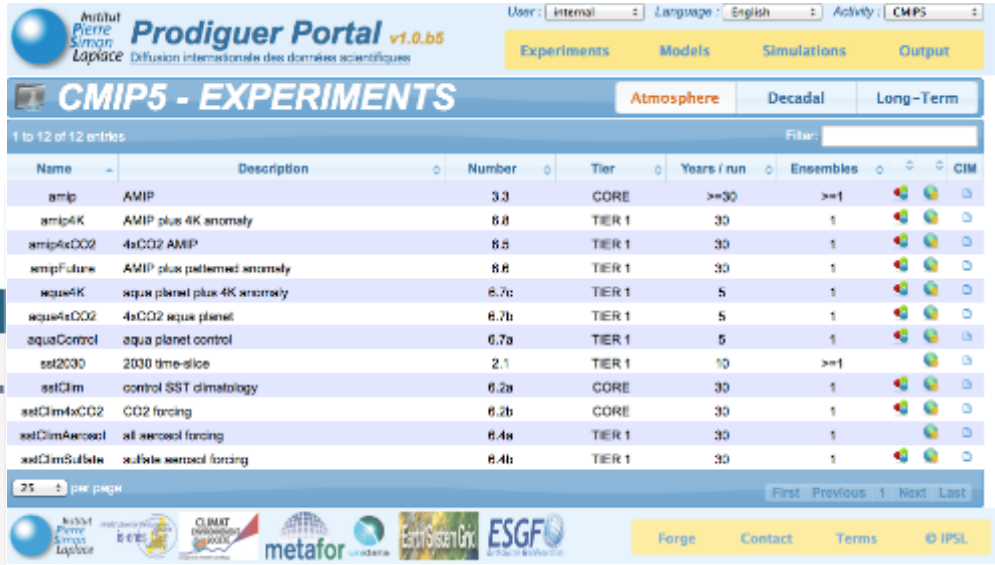
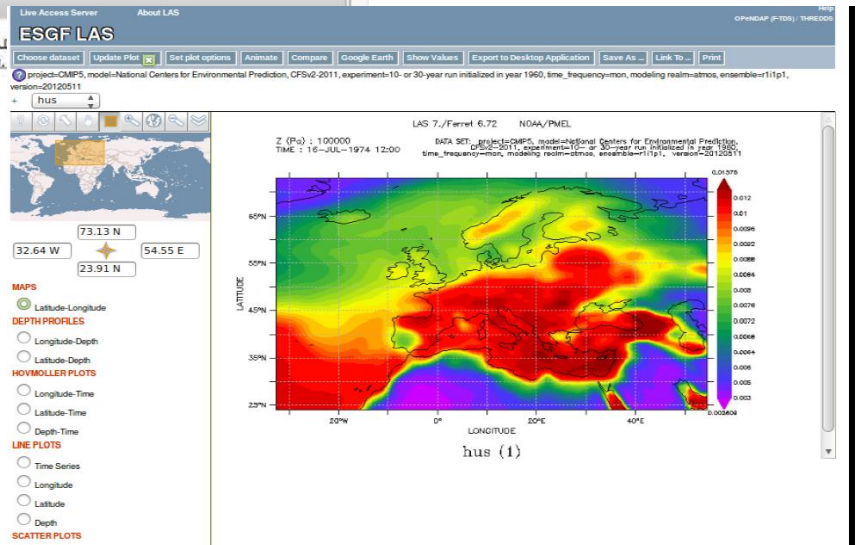
CMIP5 - Comparing and contrasting



Various user interfaces 1/2





UI 2/2

Use Cases

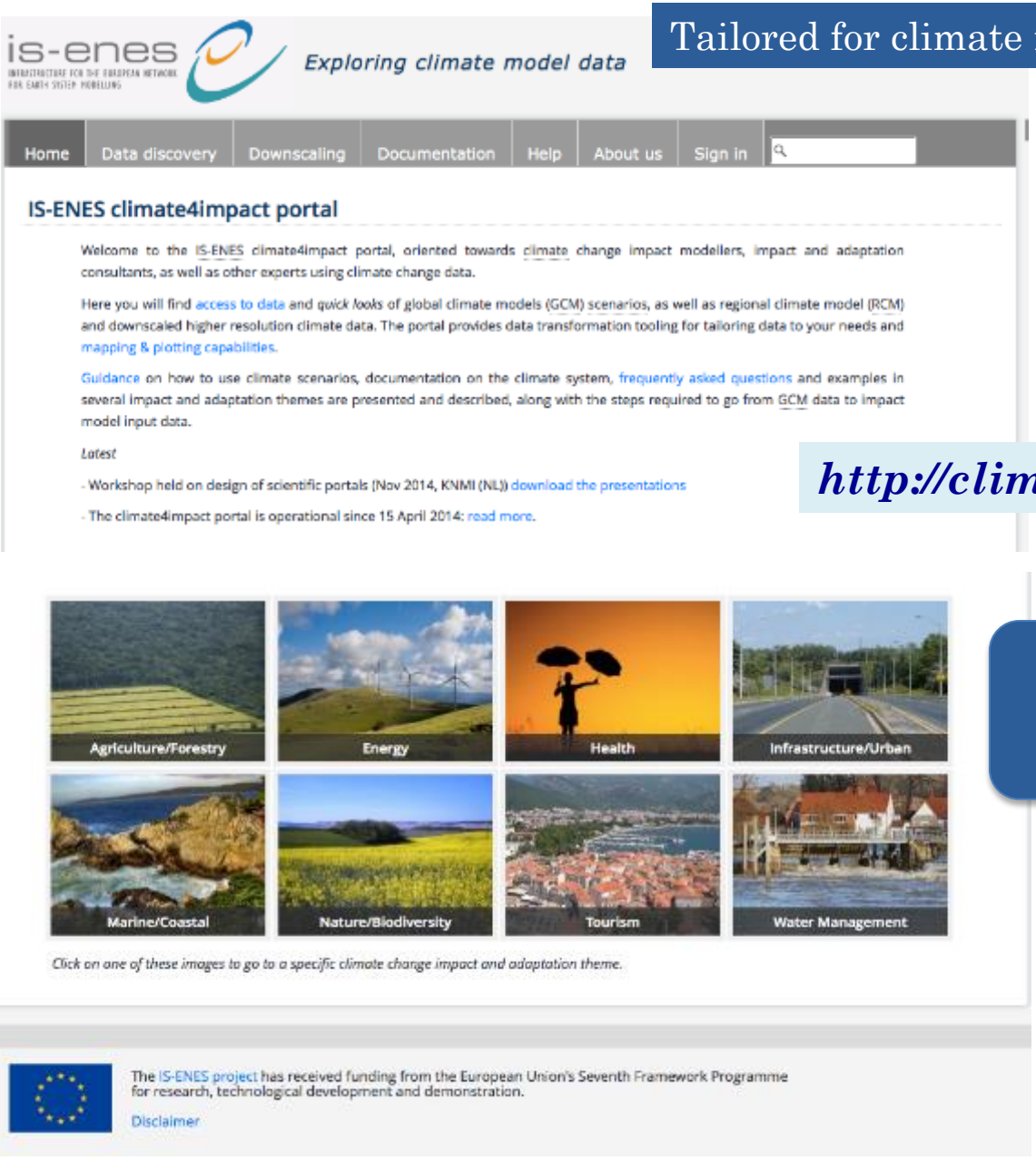
Access
CMIP5
CORDEX

Web
Services
Extraction
visualisation

Guidance

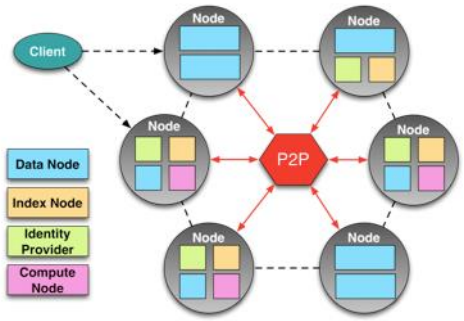
Tools:
Dowscaling
Bias
corrections
Indices

Tailored for climate impact community



http://climate4impact.eu

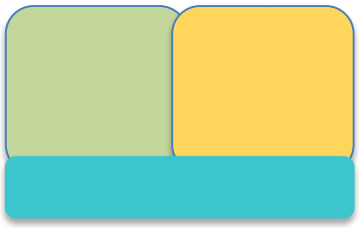
Talk by
Wim
Som de Cerff

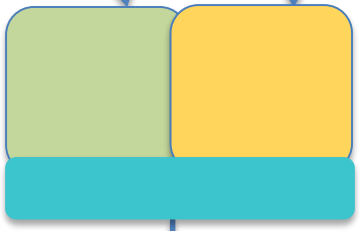


IS-ENES services & development

Users

C4I interface





Modelling groups
Provide model data
Check data/correct bugs
Manage versions
Provide metadata

Data node

Data node

Ease access to model data
Processing tools
KNMI/CERFACS

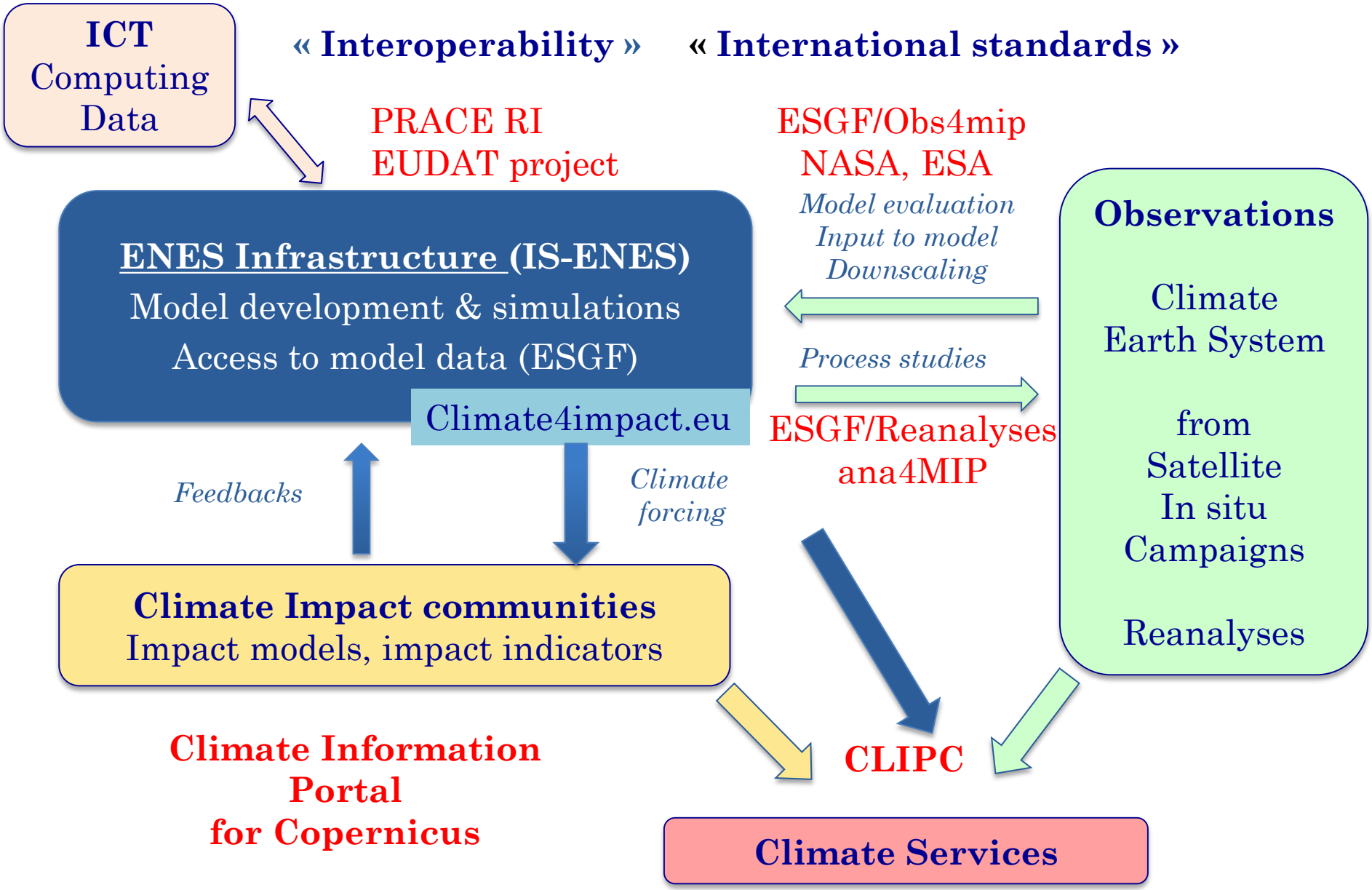
CMIP5 European Index nodes
BADC / DKRZ / IPSL/ CMCC
Euro-cordex index nodes
BADC/DKRZ/IPSL/DMI/LIU
Security SW ***BADC***
Monitoring ***CMCC***
Replication SW ***IPSL***
Replication sites ***BADC/DKRZ***
Access to metadata ***IPSL/DKRZ/BADC***

Installation SW ***IPSL/DKRZ/ BADC***
Help/FAQ ***DKRZ/BADC*** / *PCMDI*

USA
Search APIs *NASA / JPL*
Computing *PCMDI*
Network/Globus *PCMDI*
Visualisation *PCMDI*

Joint Research Activity
Data citation ***DKRZ***
Controlled vocabularies
NCAS/BADC / *NOAA*

IS-ENES : Infrastructure for ENES



Conclusions

WCRP model data base using ESGF:
Success but also challenging for CMIP5
Still needs some improvements – CMIP6 under preparation
Metadata : new
WCRP: more largely use ESGF (Obs4MIP, Ana4MIP)

IS-ENES projects :
instrumental to support European contribution to ESGF
For CMIP5 but also Cordex
IS-ENES part of ESGF international governance:
A strong expertise & contribution to ESGF

Towards a long-term research infrastructure for climate modelling
CliM-ERI "Earth's CLImate system Modelling European Research Infrastructure"
Infrastructure supporting CMIP cycles (models, data, metadata, computing)
IS-ENES a first step
A service for climate and climate impact research
An asset for Copernicus C3S to access climate projections
CLIPC as an extension of IS-ENES2

SeaWIFS Project (NASA/GSFC et Orbimage)