EC-Earth and ESGF

Kim Serradell

Pierre-Antoine Bretonniere

(Computational Earth Sciences, BSC)

Prashanth Dwarakanath

(Linkoping University/NSC)

Co-funded by
the European Union

PRIMAVERA

03/12/2017

7th Annual ESGF F2F 2017

Barcelona
Supercomputing
Center
Centro Nacional de Supercomputación
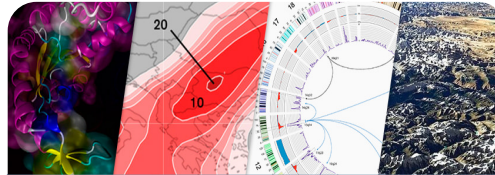
EXCELENCIA
SEVERO
OCHOA

Outline

- Barcelona Supercomputing Center

- EC-Earth climate model

- BSC Experience

- LIU

- EC-Earth and ESGF

Barcelona Supercomputing Center
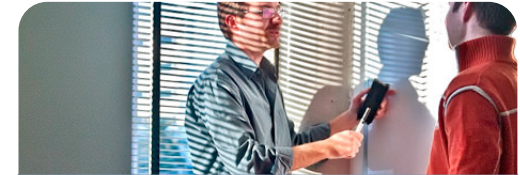# Centro Nacional de Supercomputación

BSC-CNS objectives

Supercomputing services to Spanish and EU researchers

R&D in Computer, Life, Earth and Engineering Sciences

PhD program, technology transfer, public engagement

BSC-CNS is a consortium that includes

Spanish Government	**60%**	
Catalonian Government	**30%**	Generalitat de Catalunya **Departament d'Empresa i Coneixement**
Univ. Politècnica de Catalunya (UPC)	**10%**	UNIVERSITAT POLITÈCNICA DE CATALUNYA UPC BARCELONATECH

Barcelona Supercomputing Center
Centro Nacional de Supercomputación

Earth Sciences Department

What

Environmental forecasting

Why

Our strength …
　　　… research …
　　　… operations …
　　　… services …
　　　… high resolution …

How

Develop a capability to model air quality processes from urban to global and the impacts on weather, health and ecosystems

Implement climate prediction system for subseasonal-to-decadal climate prediction

Develop user-oriented services that favour both technology transfer and adaptation

Use cutting-edge HPC and Big Data technologies for the efficiency and user-friendliness of Earth system models

Earth system services

Climate prediction

Atmospheric composition

Computational Earth sciences

EC-Earth

EC-Earth Model

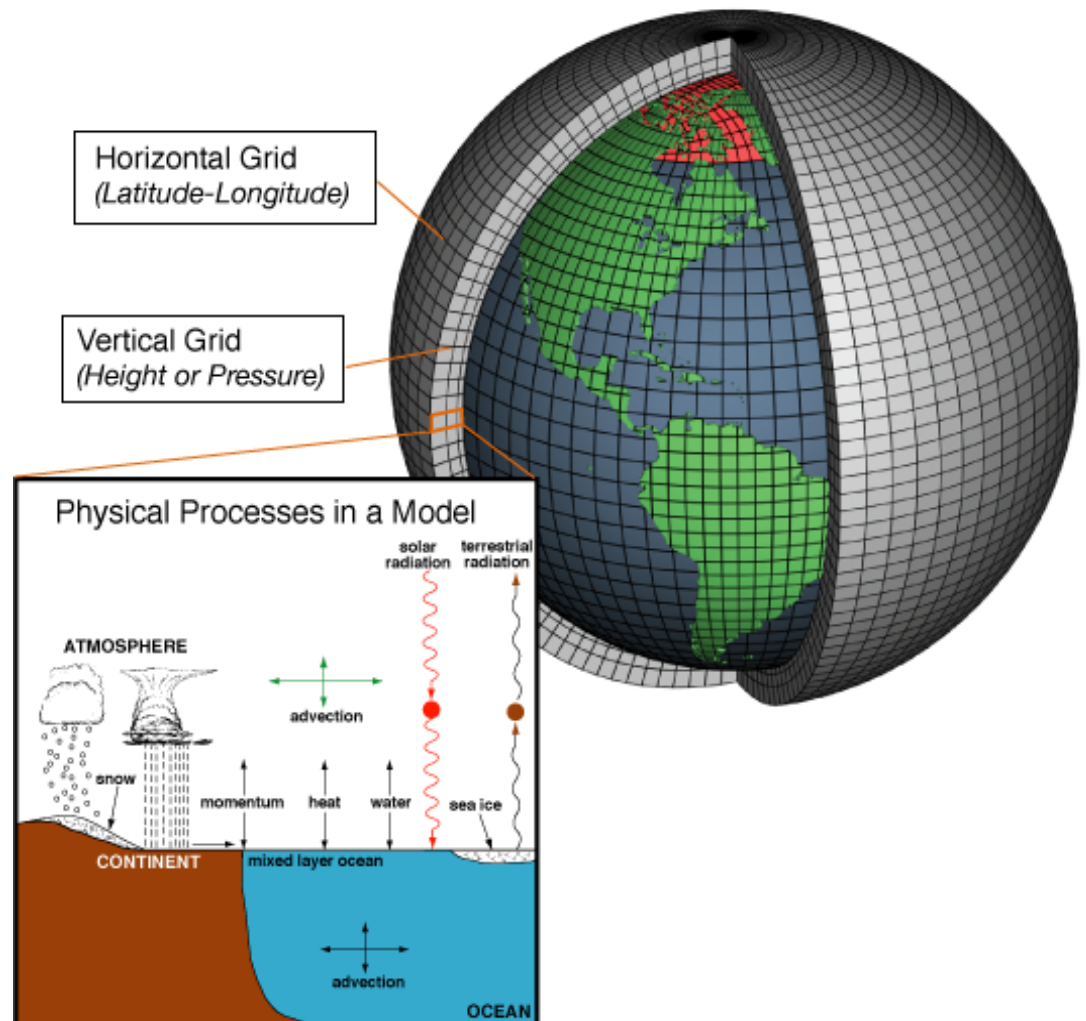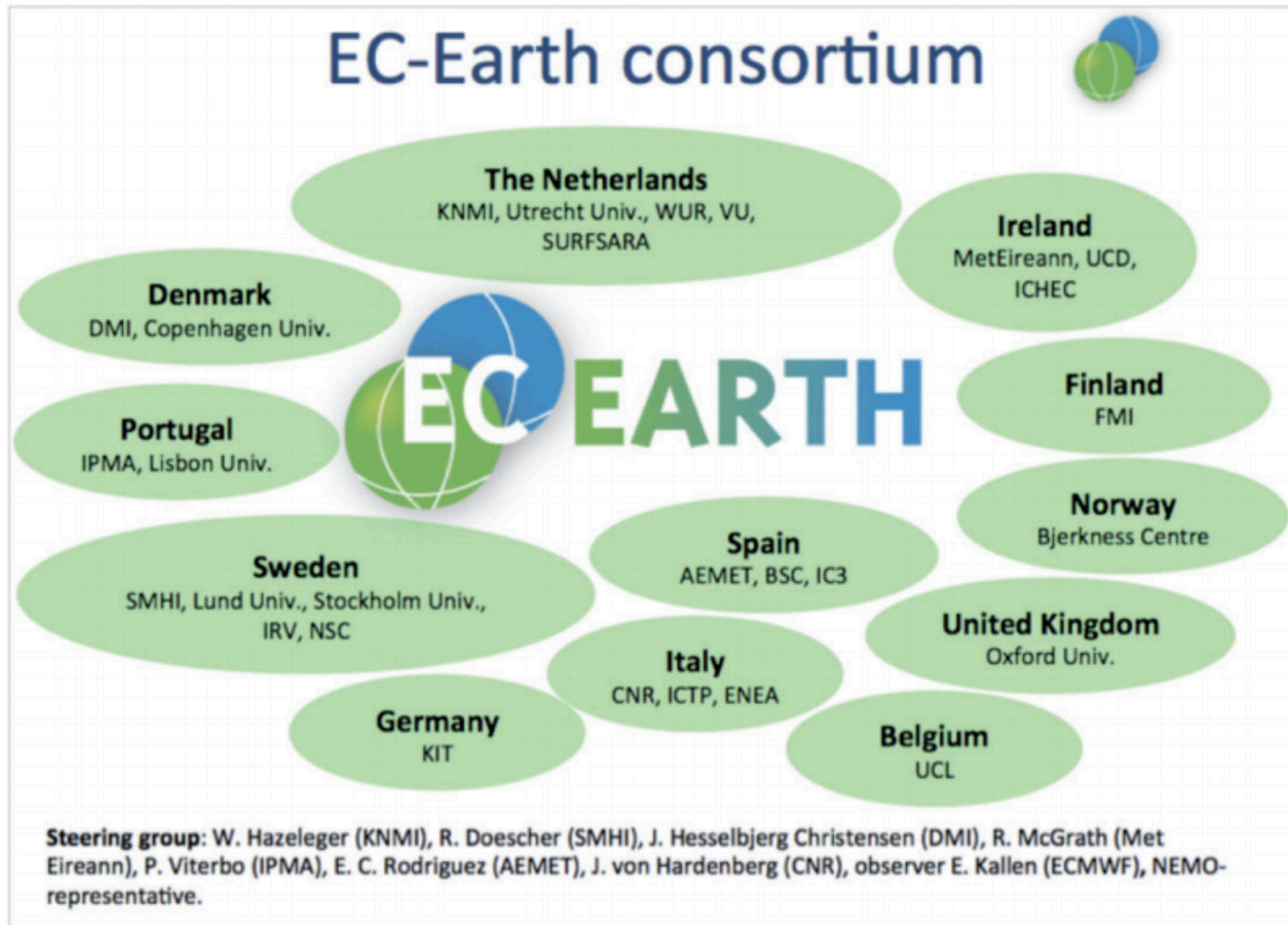**EC-EARTH coupled model**

- The Integrated Forecasting System (**IFS**) as atmosphere model

- The Nucleus for European Modelling of the Ocean (**NEMO**) as ocean model

- The **OASIS3-MCT** coupler

- The Louvain-la-Neuve sea-Ice Model 3 (**LIM3**) as sea ice model

Horizontal Grid
(Latitude-Longitude)

Vertical Grid
(Height or Pressure)

Physical Processes in a Model

solar radiation   terrestrial radiation

ATMOSPHERE

advection

snow

momentum   heat   water   sea ice

CONTINENT   mixed layer ocean

advection

OCEAN

Community driven development

Schematic outline of the EC-Earth consortium and its members as of May 2014.

PRIMAVERA H2020

- a [European Union Horizon2020](#) project,

- a new generation of advanced and well-evaluated high-resolution global climate models,

- simulations and predictions of regional climate with unprecedented fidelity,

- for the benefit of governments, business and society in general.
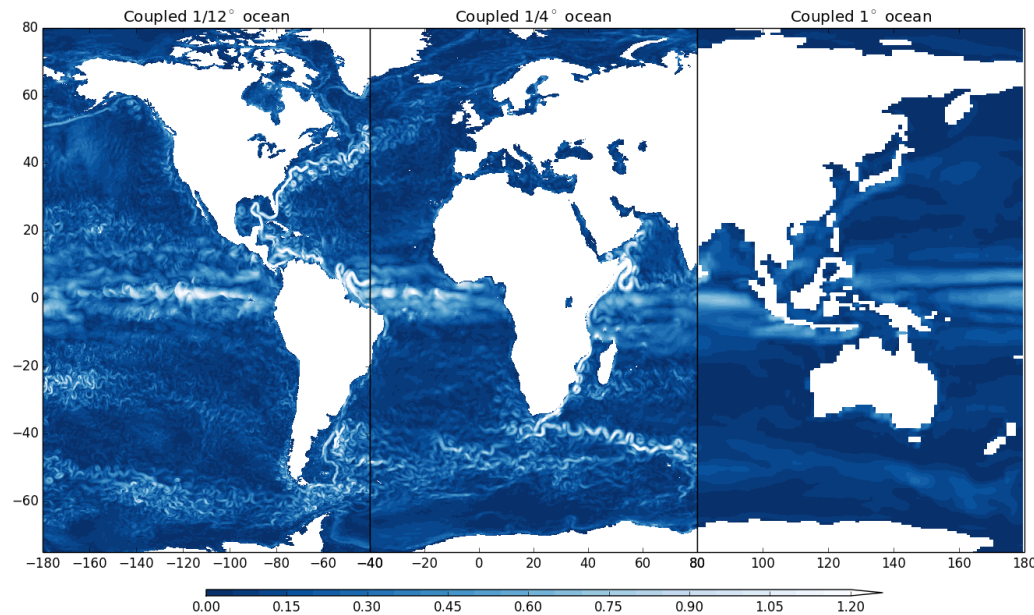
Ocean surface currents from HadGEM3-based global coupled (atmosphere-ocean/sea-ice) models at three different resolutions - (left) 25km-1/12 degree, (middle) 60km-1/4 degree, (right) 130km-1 degree (courtesy of Malcolm Roberts)

Barcelona Supercomputing Center
Centro Nacional de Supercomputación

BSC Experience

BSC Data Node

- ESGF Tier 2 "data" node: publishing BSC and AEMET PRIMAVERA and CMIP6 data

- Index node at STFC (partner involved in PRIMAVERA)

- PRIMAVERA Stream 1 data still uploaded to Jasmin but published from BSC node

- PRIMAVERA Stream 2 data will be only stored and published from BSC

- Estimate of ~600TB of PRIMAVERA data

BSC Data Node

Index node

Data node

BSC Data Node

BSC cmorization

- Part of PRIMAVERA project

  - [ece2cmor3](#) is trying to standardize the cmorization within EC-Earth

  - Developed by a set of partners (KNMI/e-Science Center and BSC)

  - But each partner cmorizes its own data (lots of coordination needed)
    - online (on HPC as the simulation runs to only store cmorized data)
    - offline (adding time to publish)

Barcelona
Supercomputing
Center
Centro Nacional de Supercomputación

BSC Data Node (installer)

- March 2017:

    - started installing version 2.3 to publish CMIP5/SPECS data as test

    => impossible due to dependencies pointing to updated versions of packages breaking compatibility of the overall installation

- August 2017:

    - Successfully ran version 2.5 of the installer, even if still under development

BSC Data Node (publisher)

Once we had the node up and running, updating:

- updating the esg.[primavera-cmip6].ini } PRIMAVERA specific

- esgcet_models_table.txt } EC-Earth specific

- certificates and PIDs landing pages } BSC specific

BSC recommendations

- Fresh start installation testing

- Semantic versioning of
  - dependencies (git submodules?)
  - releases

- Allow users to install dependencies by hand within the installer run

- Identify who (person or institution) is responsible for what (PIDs, installation, publication,...)

- Wiki/documentation for "beginners"
  - How to's?
  - How to deploy a production and a testing server

Barcelona
Supercomputing
Center
Centro Nacional de Supercomputación

LIU

LiU on ESGF and CDNOT

- LiU operates a Tier-1 ESGF node, offering all ESGF services, including index peering to other datanodes, funded by SMHI and IS-ENES projects.

- Hosts CORDEX, CMIP5, SPECS, and CLIPC projects, from SMHI.

- Manages attribute services for CORDEX data access.

- Mailing list maintainer for esgf-cordex@lists.nsc.liu.se, for users registered to access CORDEX data on ESGF.

- LiU Manages one of the ESGF Federation CAs and helped develop CA policy for ESGF.

- Prashanth Dwarakanath (LiU) co-leads the ESGF Installation Working Team, and is a representative for EC-EARTH in CDNOT.

- Kai Lu (LiU) is an active contributor to user support on ESGF Users and IWT mailing lists.

Barcelona Supercomputing Center
Centro Nacional de Supercomputación

Ongoing and future activities on CDNOT

- LiU has contributed to achieving better documentation by authoring manuals for data node administrators, and looks to take an active role in documenting procedures for CMIP6 data publication and node operations.

- Has conducted training workshops and code sprints and is working on developing a suite of tools to reduce uncertainties with infrastructure setups for workshops and collaborative development events.

- Actively working on setting up of an Incident-response team, and to disseminate training and documentation to ensure adoption of security best-practices.

Barcelona Supercomputing Center
Centro Nacional de Supercomputación

EC-Earth and ESGF

Previous experiences

- CMIP5 and SPECS
  - Centralized at BADC
    - Only a reduced set of partners was involved in the public
  - Data Node in LIU
  - Partners without data node had to:
    - Upload lots of data
    - Needing assistance

Future experiences

- CMIP6 (PRIMAVERA)
  - More data
    - spatial resolution increasing
    - spatial dissemination increasing (more partners)

  - More partners
    - more ESGF/EC-Earth data nodes
    - more "ESGF beginners"

  - How to deal with such a project?
    - at the EC-Earth level
    - at the ESGF level

EC-Earth's contributions to CMIP6

Institute	Contact	Contributions	HPC platform	ESGF node
1. AEMET	J. A. Parodi Perdomo	DECK (EC-Earth3-CC)	Cray XC30@ECMWF + BULL@AEMET	? (BSC?)
2. BSC/IC3	F. Doblas-Reyes	DECK, DCPP, HighResMIP (?)	Marenostrum@BSC	BSC
3. CNR	J. von Hardenberg	DECK (EC-Earth-CC, EC-Earth-CC-LR)		CNR
4. DMI	S. Yang	DECK, DCPP, GeoMIP, HighResMIP, ISMIP6, LS3MIP,SenarioMIP	Cray XC30@DMI/IMO	DMI
5. ENER	A. Alessandri	LS3MIP	Cray XC30@ECMWF	
6. FMI	H. Korhonen	AeroChemMIP	Cray XC30@FMI	FMI/UHEL
7. IPMA	P. Viterbo	??		
8. KIT	A. Arneth	C4MIP, LUMIP		
9. KNMI	R. Bintanja	DECK, AeroChemMIP, CFMIP(?), HighResMIP, SenarioMIP	Cray XC30@ECMWF + BULL@KNMI	KNMI
10. MetEirre/ ICHEC	R. McGrath	DECK, HighResMIP, SenarioMIP	Cray XC30@ECMWF +Cray XC40@PRACE	ICHEC
11. LU	P. Miller	C4MIP, LUMIP		
12. MISU	L. Brodeau	DECK		
13. NGSU	Q. Zhang	PMIP		NSC
14. SMHI	K. Wyser	DECK, C4MIP, HighResMIP, C4MIP, SenarioMIP		LIU
15. UHEL	R. Makkonen	AeroChemMIP	Cray XC30@CSC	FMI/UHEL

Thank you

kim.serradell@bsc.es