PRACE → *the* European HPC Research Infrastructure

April, 23rd 2010 creation of the legal entity (AISBL) PRACE with seat location in Brussels, Belgium

- Enabling **world-class science** through large scale simulations

- Providing **HPC services** on **leading edge capability** systems

- Operating as a **single entity** to give access to **world-wide supercomputers**

- **Attract**, **train** and **retain** competences

- **Lead** the **integration** of a highly effective **HPC ecosystem**

- Offering its resources through a **single** and **fair** pan-European **peer review process to academia and** industry
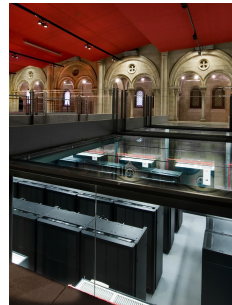
- **25** members, since 2010
- **6** supercomputers in **4** hosting countries, nearly **15 Pflop/s**
- Common operation procedure between **35** centers in Europe
- **22** prototypes evaluated
- **169** white papers produced
- **1500** communications from our users
- **166** Thesis
- HPC Community building: **183** events

- **8 billion** hours granted since 2010 (a system with 900k cores for 1 year)
- **303** scientific projects enabled from **38** countries
- More than **20 SME** and **industries** access in first year
- **360** PATC Training days
- **2734** Trained people
- **170** applications enabled

ESFRI

PRACE

PRACE's achievements:

In 2013, nearly 15 Pflop/s provided

MareNostrum: IBM IDPX at BSC, >48 000 cores

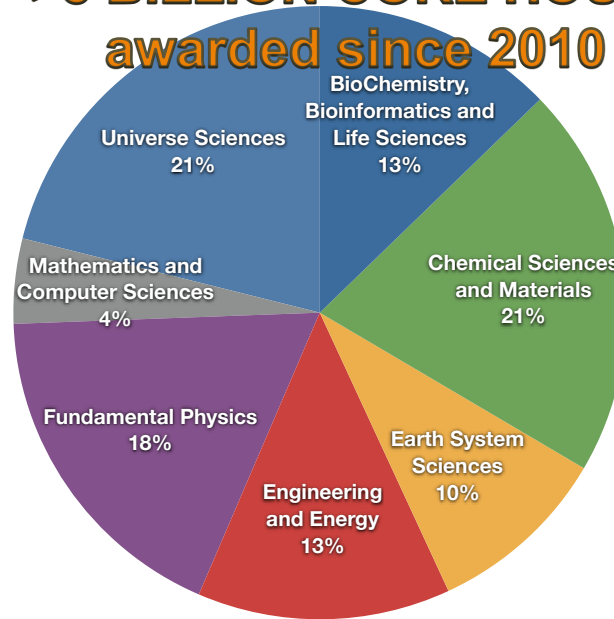**JUQUEEN:** IBM BlueGene/Q at GCS partner FZJ, >458 000 cores

FERMI: IBM BlueGene/Q at CINECA, >163 000 cores

SuperMUC: IBM IDPX at GCS partner LRZ, >155 000 cores

CURIE: Bull Bullx at GENCI partner CEA >90 000 cores.

HERMIT: Cray at GCS partner HLRS, >113 000 cores

>8 BILLION CORE HOURS awarded since 2010

Pie chart:
- Universe Sciences 21%
- BioChemistry, Bioinformatics and Life Sciences 13%
- Chemical Sciences and Materials 21%
- Earth System Sciences 10%
- Engineering and Energy 13%
- Fundamental Physics 18%
- Mathematics and Computer Sciences 4%

Peer Review access for HPC

- Applications received
  - 725 proposals received, 303 awarded
  - With participants from 38 countries
- Peer review
  - 1349 reviewers in the database
  - 1122 "active" reviewers (at least 1 review for PRACE from EAC to Call 8)
  - 42 countries in the database
  - 33 "active" countries
- Prioritization panel
  - 7 AC members renewed every 2 years, nominated by the SSC
  - 132 Panellist supporting their decisions
  - 18 countries represented in the panels

Success Stories

Example 1: Seismology

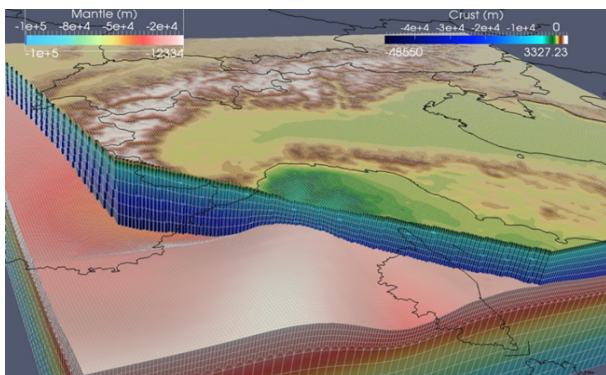**53,4 million core hours on SuperMUC (Germany) for Italy** →

The massive allocation of computing resources can be used to **explore the non-linearity involved in the dependence of local ground shaking on geological structure**, by analysing suites of physically consistent, and geologically plausible, models.

Team: Dr. Andrea Morelli – Instituto Nazionale di Geofisica e Vulcanologia, Italy

Goal: Produce an estimate of **the impact of ground shaking on Northern Italy after major earthquakes.**
Provide better foundations for decision-making processes for societal preparedness for earth quakes.
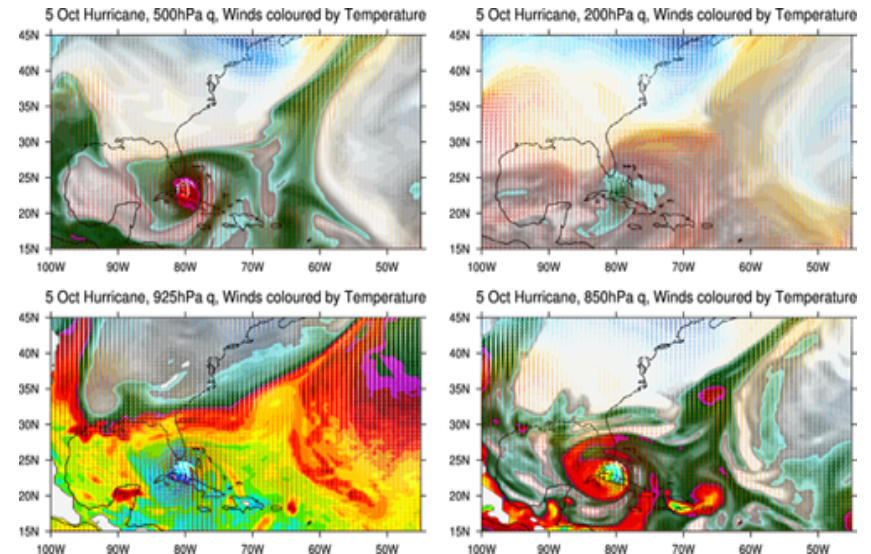

Example 2: Climate

144 million core hours on Hermit (Germany) for UK - UB →

PRACE will give to UK **Meteorology** office a 3-year advance in the development of their models.

Goal: to develop high resolution global **weather & climate models** (12km)

Team: Prof. Pier Luigi Vidale (NCAS-Climate, Dept of Meteorology, Univ. of Reading and UK Met Office, Exeter, UK)

5 Oct Hurricane, 500hPa q, Winds coloured by Temperature
5 Oct Hurricane, 200hPa q, Winds coloured by Temperature
5 Oct Hurricane, 925hPa q, Winds coloured by Temperature
5 Oct Hurricane, 850hPa q, Winds coloured by Temperature

Big Data – what about it?

From discussions with Scientific communities PRACE has identified **challenges in the storage, analysis, visualization and transfer of data** connected to large-scale simulations.

PRACE Council in February 2013 decided:
BoD with the support of the IP project, should prepare an *Expression of Interest regarding Big Data*. *This EOI should be broadly distributed for later analysis by the corresponding bodies of the association, for later information to the Council.*

Invitation for Expression of Interest Big Data

- **Scientific justification** and why the handling of data must be closely integrated with the PRACE computing services.

- Expected **amount of data**, **time-frame** for data access and expected computing resources.

- **Management** & use of data.

- **Data open/not open** to the wider scientific community? And how to handle scientific accessibility and usability?

- **Transfer** of data to/from the PRACE resource.

Received EoI Big Data

33 proposals from **8 scientific domains**

Earth Sciences and Universe Sciences have the biggest need for long-term access to data and extensive computing resources

Storage need in general: **10-200 Tb**, but a few projects **reach the Pb level**

5 years access to stored data. First with embargo on data, later on **Open Access** for the Scientific community

A **PRACE Big Data policy** would help to **deploy the full scientific potential** of Tier-0 simulations

8

33 proposals from **8 scientific domains**

Domain	Expressions of Interest
Oceanography/climate/seismology	7 (3/3/1)
Genomics	1
Engineering/CFD	7
Life sciences	2
Universe sciences	10
Plasma	1
Particle physics	1
Chemistry	2

Earth Sciences & Universe Science: needs for long-term access and big resources
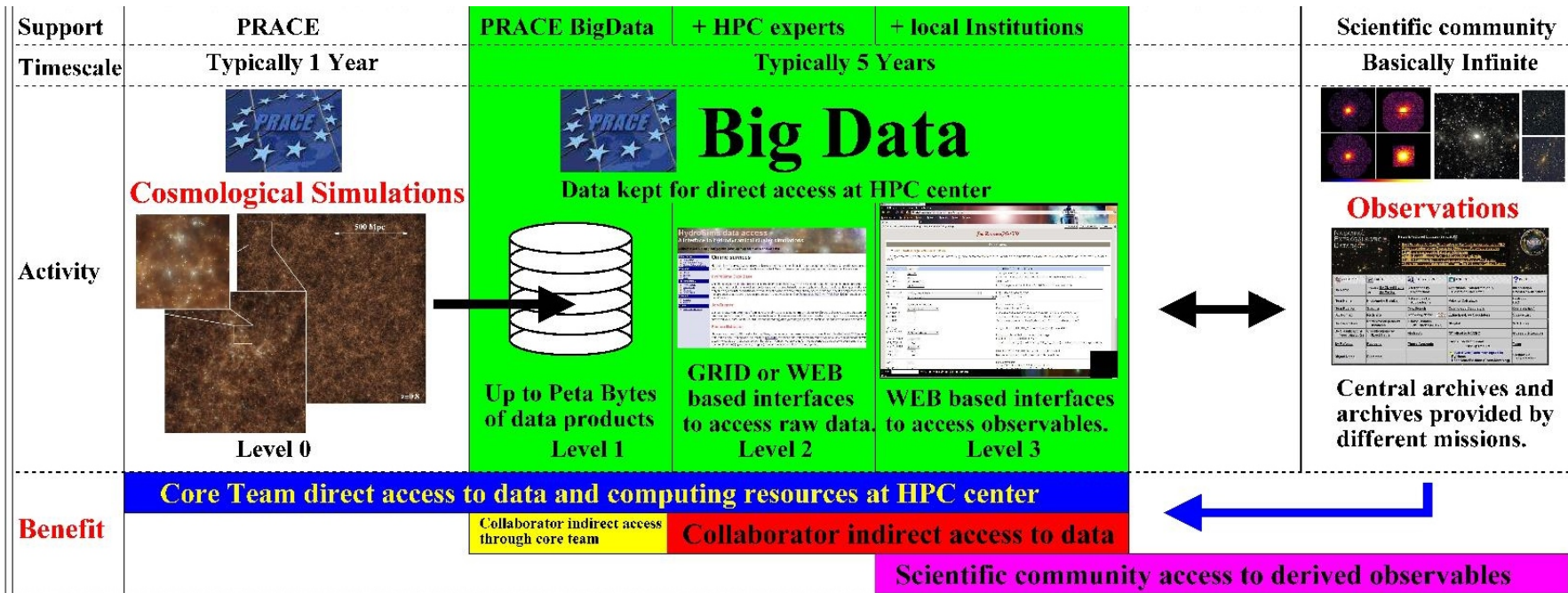
- **Universe Science**
  "New large scale survey projects (e.g Dark Energy Survey) are moving forward to address cosmic acceleration and the behavior of gravity on the largest scales => petabyte (PB) scale datasets.The PRACE computational resources have an important role to play in this."

- **Earth Sciences/ Climatology**
  "Climate integrations need moderate amounts of data for input but produce very large output: Given the output figure of 150--- 300 GB/1000 core hours, climate jobs filling a 100,000 core machine would generate 15 to 30TB/hour. We might want to run such jobs for weeks if not months. "

Access to stored data

Example given by Team Dolag/ Universe science

PRACE Big Data policy

Recommendation of PRACE Scientific Steering Committee (Dec 2013)

PRACE should develop a policy for the handling and access to large datasets arising from the use of PRACE Tier-0 resources.

Decision of PRACE Council (Feb 2014)

Action-2014-01-04: BoD shall develop a policy for the handling and access to large datasets arising from PRACE Tier-0 resource usage and present it to the Council for approval.

12

Thanks for your attention

If you have any further questions, don't hesitate to contact me.

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