## EoCoE: success stories



### 850hPa Geopotential (Isohypse: 134 gpdam)
Init: 08Aug2014 00UTC Val: 09Aug2014 12UTC
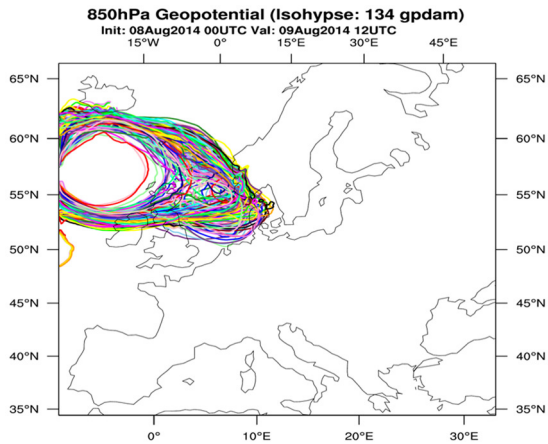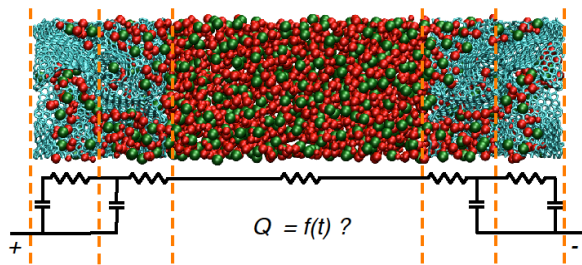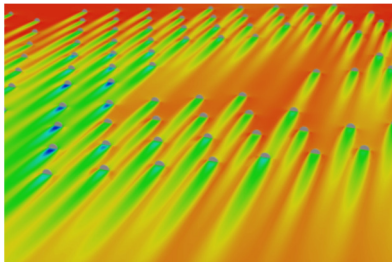
Meteorology: More accurate indicators for imminent extreme **weather forecast** errors. Image credits to H. Elbern et al. - FZJ, Germany



$$Q = f(t) ?$$

Materials: Accelerate design of **supercapacitors** to store energy faster! Image credits to M. Salanne - MdlS, France



Wind: Improving **wind-resource assessment** for energy production. Image credits to A. Gargallo et al. - BSC, Spain

## Consortium

* Maison de la Simulation (MdlS) and Institut de Recherche sur la Fusion par confinement Magnétique (IRFM) at CEA
* Forschungszentrum Jülich (FZJ), with RWTH Aachen University
* Agenzia nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile (ENEA)
* Barcelona Supercomputer Centre (BSC)
* Centre National de la Recherche Scientifique (CNRS) with Inst. Nat. Polytechnique Toulouse (INPT
* Institut National de Recherche en Informatique et Automatique (INRIA)
* Centre Européen de Recherche et de Formation Avancée en Calcul Scientifique (CERFACS)
* Max-Planck Gesellschaft (MPG)
* Fraunhofer Gesellschaft
* Friedrich-Alexander Univ. Erlangen-Nuernberg (FAU)
* Consiglio Nazionale delle Ricerche (CNR), with Univ. Rome, Tor Vergata (UNITOV)
* Università degli Studi di Trento  (UNITN)
* Instytut Chemii Bioorganicznej Polskiej Akademii Nauk (PSNC)
* Université Libre de Bruxelles (ULB)
* University of Bath (UBAH)
* Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas (CIEMAT)
* IFP Energies Nouvelles (IFPEN)
* DDN Storage

## Contact us

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# THE EUROPEAN ENERGY-ORIENTED CENTRE OF EXCELLENCE

## Towards exascale HPC for energy!



**www.eocoe.eu**

European Commission

Horizon 2020
European Union funding
for Research & Innovation

## EoCoE ... in figures

7 EU countries

22 partner institutions

over 100 experts

9 pre-exascale flagship codes

### EoCoE ... in a nutshell

The rapid adoption of renewable energy sources is seen as a key element in the European energy policy. Renewable energy sources would help to reduce greenhouse gas emissions from fossil fuels and decouple energy costs from oil prices.

EoCoE, the energy-oriented Centre of Excellence for computing applications, builds on its unique expertise at the crossroads of high-performance computing (HPC) and renewable energy. It brings an impulse to accelerate the digitization of the future energy systems.

To achieve this goal, EoCoE focuses on key energy sectors: **wind**, **meteorology**, **materials**, **water** and **nuclear fusion**. It aims to re-design and promote selected application codes from these sectors and make them ready to exploit exascale computing architectures.

The coding developments will be assisted by multi-disciplinary teams with expertise in applied mathematics and high-performance computing (HPC).
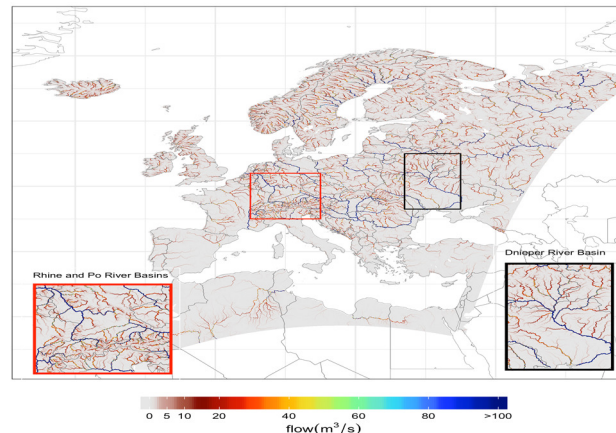
## EoCoE: success stories
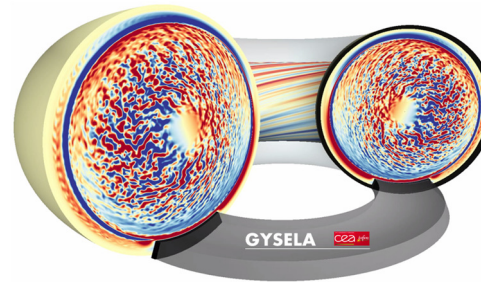


Nuclear Fusion: Simulation of tokamak plasma turbulence from edge to core. Image credits to G. Dif-Pradalier - CEA-IRFM, France
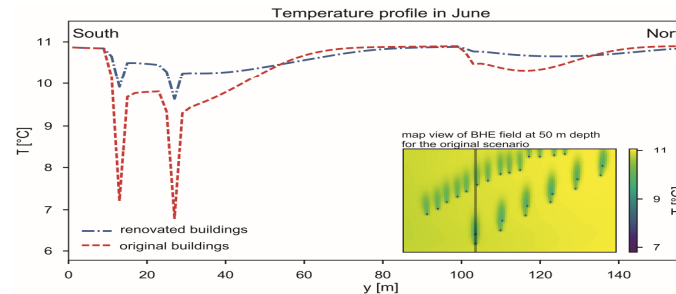


Geothermal Energy: Simulation results of potential borehole heat exchanger field in Geilenkirchen-Neuteveren
Image credits to J. Niederau et al., RWTH-Aachen, Germany



Hydropower: High-resolution river discharge modeling. Image credits to B. Naz and S. Kollet et al. - FZJ, Germany

## EoCoE: goals

* Enable modelling breakthroughs in renewable energy domains
* Foster digitalization in energy technologies to reduce greenhouse gas emissions
* Apply state-of-the-art cutting-edge mathematical and numerical methods, algorithms and visualisation tools to re-engineer modeling applications for exascale computing platforms
* Establish a single "stop-shop" to effectively exploit simulation codes
* Encourage HPC best-practices and reduce the skills gap in HPC competencies
* Support Europe to improve its competitiveness in carbon-free energy production through the use of HPC
* Improving the know-how in applying European software tools and methods for exascale computing

## EoCoE: approach

The Centre of Excellence is committed to delivering performance enhancements for a selection of established codes in energy research. To achieve this, a series of instruments will be deployed

* Performance analysis workshops
* Collaborative platforms for application development and dissemination
* Open Software-as-a-Service (SaaS) portal offering HPC services
* Interdisciplinary approach whereby the technical expertise complements the scientific challenge in an effective organizational grid
* Exascale transversal team ensuring a multidisciplinary approach to co-design software development