



## Weather and Air Quality

- Challenge #1:** The need for very high resolution atmospheric models and associated forecasting system
- Challenge #2:** High-resolution assimilated air quality forecast and cloud-aerosol-radiation interaction models.
- Challenge #3:** Develop pan-European short-range weather and air quality modelling systems

### Climate Modeling and Simulations

- Address porting issues on Peta/Exascale architectures
- Improve the scalability of “coupled” models
- Exploit Capacity and Capability systems
- Develop innovative algorithms and numerical schemes

## Climate of the Earth System

- Challenge #1:** Running very high-resolution models to better understand, quantify and predict extreme events and to better assess the impact of climate change on society and economy on the regional scale
- Challenge #2:** Moving from current climate models towards full Earth System Models
- Challenge #3:** Quantifying uncertainty
- Challenge #4:** Investigating the possibility of climate surprises with longer simulations

### Scientific data management

- New arch. & frameworks for high performance (big) data analytics
- Efficient storage models for scientific databases at Peta/Exascale
- Innovative approaches for (near) real time knowledge discovery from data (e.g. in-memory databases)

**CoE or Co-Design Center** would address the current lack of interdisciplinary efforts among climate, numerical, computational scientists and technology providers

## Oceanography and Marine Forecasting

- Challenge #1:** High-resolution ocean circulation models
- Challenge #2:** Carbon fluxes
- Challenge #3:** Understanding and monitoring of marine ecosystems

### Exascale Climate and Weather Science (ECWS) Co-Design Center or CoE

where integrated teams of climate and weather science researchers, applied mathematicians, computer scientists and computer architects would strongly cooperate

## Solid Earth Sciences

- Challenge #1:** Earthquake ground motion simulation and seismic-hazard
- Challenge #2:** High resolution imaging techniques
- Challenge #3:** Structure and Dynamics of the Earth’s Interior
- Challenge #4:** Generation of the Earth’s magnetic field

