

Perspective of the Helmholtz Association

Thomas Jung

Alfred Wegener Institute Helmholtz Centre for Polar and Marine
Research

The ESM project



HELMHOLTZ RESEARCH FOR GRAND CHALLENGES

CONTRIBUTE TO SOLVING GRAND CHALLENGES THROUGH ADVANCED EARTH SYSTEM MODELLING

A satellite image of the Earth showing the Western Hemisphere, including North and South America, the Atlantic Ocean, and the Pacific Ocean. The image is used as a background for the central text.

ESM
Advanced Earth System Modelling Capacity

- Advanced Earth System Modelling Capacity (ESM)
 - Funded by the Helmholtz Association
 - Continued in PoF-IV
- <http://esm-project.net>

Earth system model compartments



Think wide: From the atmosphere to the solid Earth

Helmholtz:

- Atmospheric systems
- Ocean-cryosphere-biosphere systems
- Terrestrial systems
- Geosphere

Earth system model coupling



Facilitate “easy” and flexible coupling

→ Earth system modeling system

Earth system data assimilation

Provide (coupled) data assimilation capacity

- Initialization of forecasts
- State estimation and monitoring
- Observing system design
- Model improvement

Earth system model diagnosis



Confront models with observations

- Identify model short-comings and prioritize future research
- Measure progress

Additional elements

- We need to think HPC (hardware)
 - DKRZ
 - Jülich Supercomputing Centre
 - ...
- We need to think software engineering
 - Extreme-scale computing (separation of concerns, work flows, ExtremeEarth)
 - Common infrastructures (within and outside of models)
- We need to think data

Summary



The vision could be to provide an integrative modelling environment that enables the various communities to easily adapt and apply the models according to their respective requirements (incl. standard and interfaces):

- Enable interaction of distributed competences and expertise from different disciplines and allow for individual strength/excellence
- Advance science and assure international competitiveness in Earth System Modelling
- Enable us to answer questions posed by society, science and decision makers
- Ensure an open approach that allows for effective collaboration with national and international partners
- Ensure open and transparent governance