



# HGF Alliance: Remote Sensing and Earth System Dynamics

*Presented by Irena Hajsek - DLR-HR/ ETH*

# The Team



Helmholtz Center for Environmental Research (**UFZ**),  
 Forschungszentrum Jülich (**FZJ**), German Research Center  
 for Geoscience (**GFZ**), Alfred Wegener Institute for Polar  
 and Marine Research (**AWI**), Karlsruhe Institute of  
 Technology (**KIT**), Helmholtz Center for Ocean Research  
 (**GEOMAR**), German Research Center for Environmental  
 Health (**HGMU**), Potsdam Institute for Climate Impact  
 Research (**PIK**), Federal Institute for Geosciences and  
 Natural Resources (**BGR**), Forest Stewardship Council (**FSC**),  
 Philipps-University Marburg (**PUM**), Technical University  
 Munich (**TUM**), Friedrich Schiller University Jena (**FSU**),  
 Friedrich-Alexander University Erlangen-Nuremberg (**FAU**),  
 University Hamburg (**UHH**), Ludwig Maximilian University  
 Munich (**LMU**), University Potsdam (**UP**), Swiss Federal  
 Institute of Technology Zurich (**ETHZ**)

## Principal Investigator

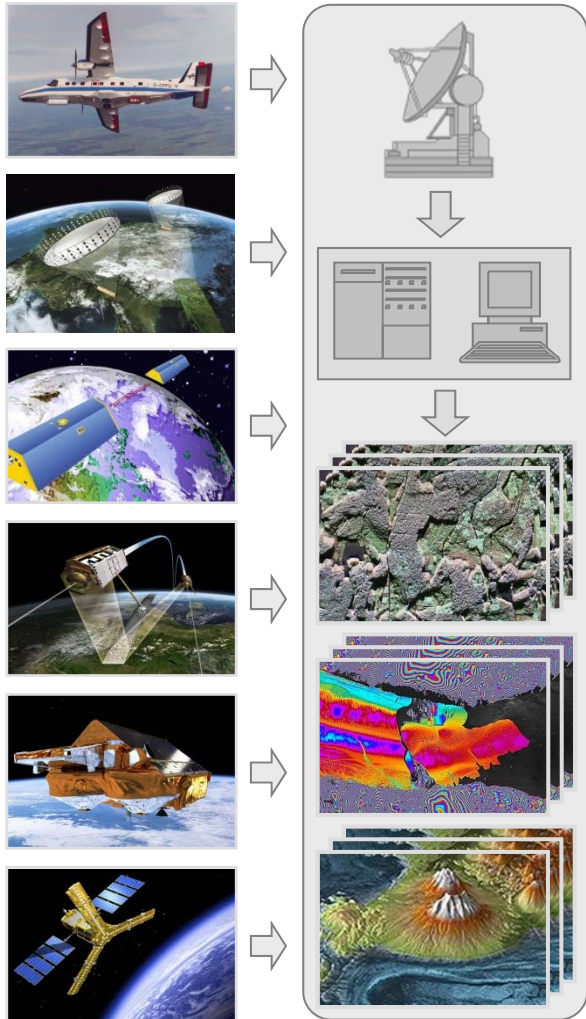
German Aerospace Center (**DLR**)  
 Microwaves and Radar Institute

## Scientific Coordinators

German Aerospace Center (**DLR**)  
 Helmholtz Center for Environmental Research (**UFZ**)



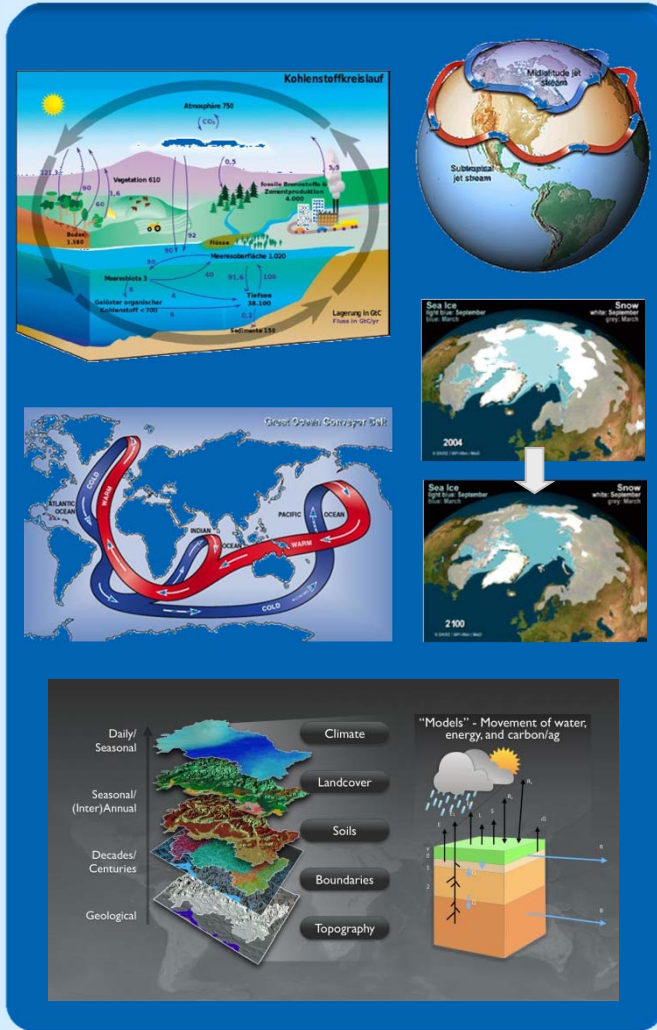
# Next Generation of Remote Sensing Satellites



Satellites

Ground Segment

# Remote Sensing Products and Earth System Dynamics



# Societal Challenges

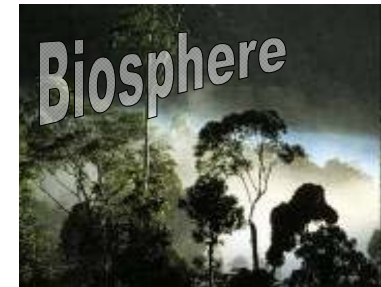


Helmholtz Alliance:  
Remote Sensing and Earth System Dynamics

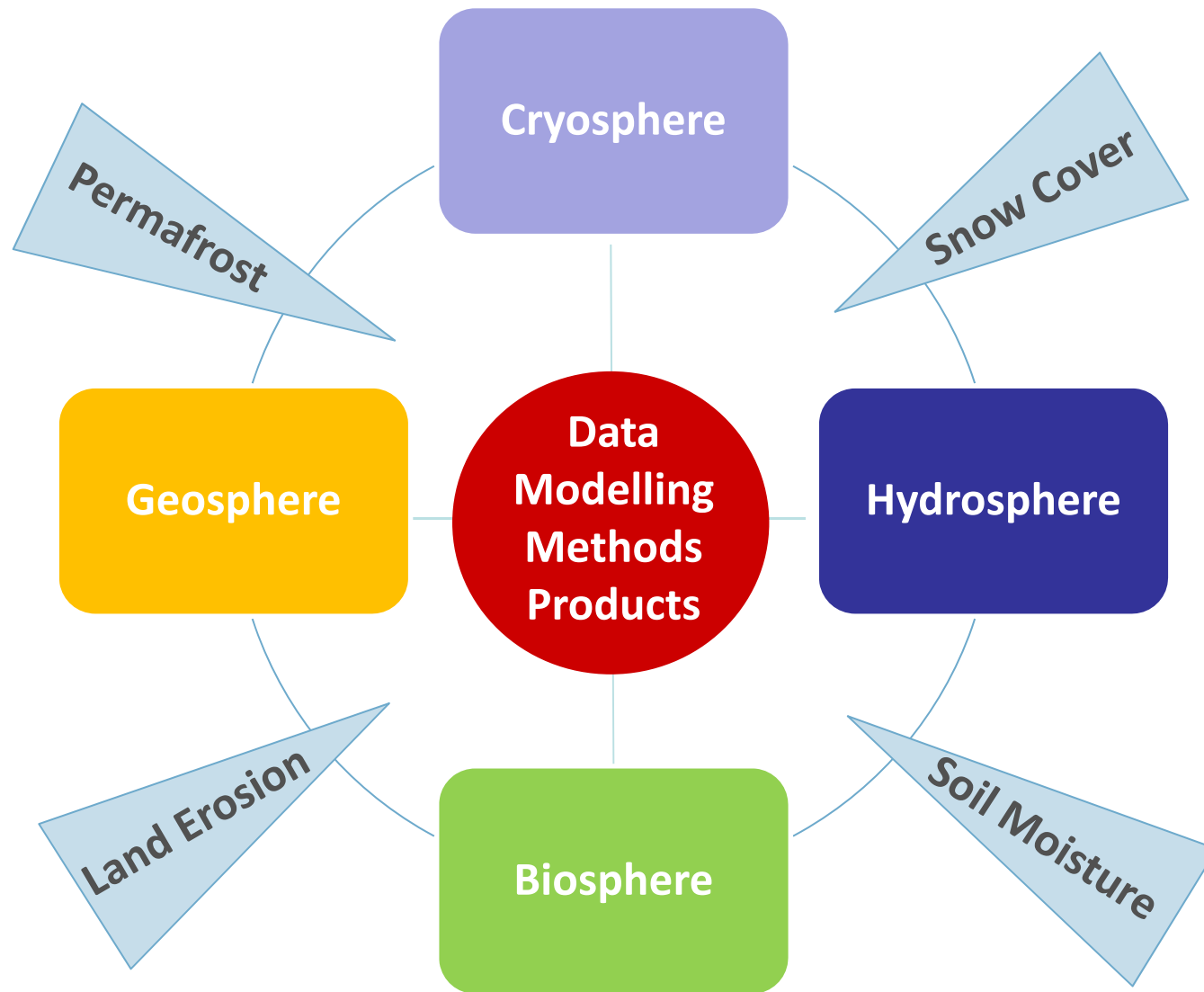
# Remote Sensing and Earth System Dynamics (EDA)

The **key objective of the Helmholtz Alliance** is to prepare the participating institutions for the generation, utilization and integration of bio/geo-physical products provided by the next generation radar remote sensing missions by:

- **developing/validating bio/geo-physical information products**
- integrating the **physical products into models**
- improving the **understanding/modeling of dynamic processes**
- **establishing a network** between Helmholtz centers/Universities
- providing a unique **forum for education**



# Examples of Research Topics Interactions



# Alliance Structure

## Working Packages (WPs):

- **Biosphere:** 08 WPs
- **Geosphere:** 12 WPs
- **Hydrosphere:** 11 WPs
- **Cryosphere:** 09 WPs

## 3 Levels of Networking

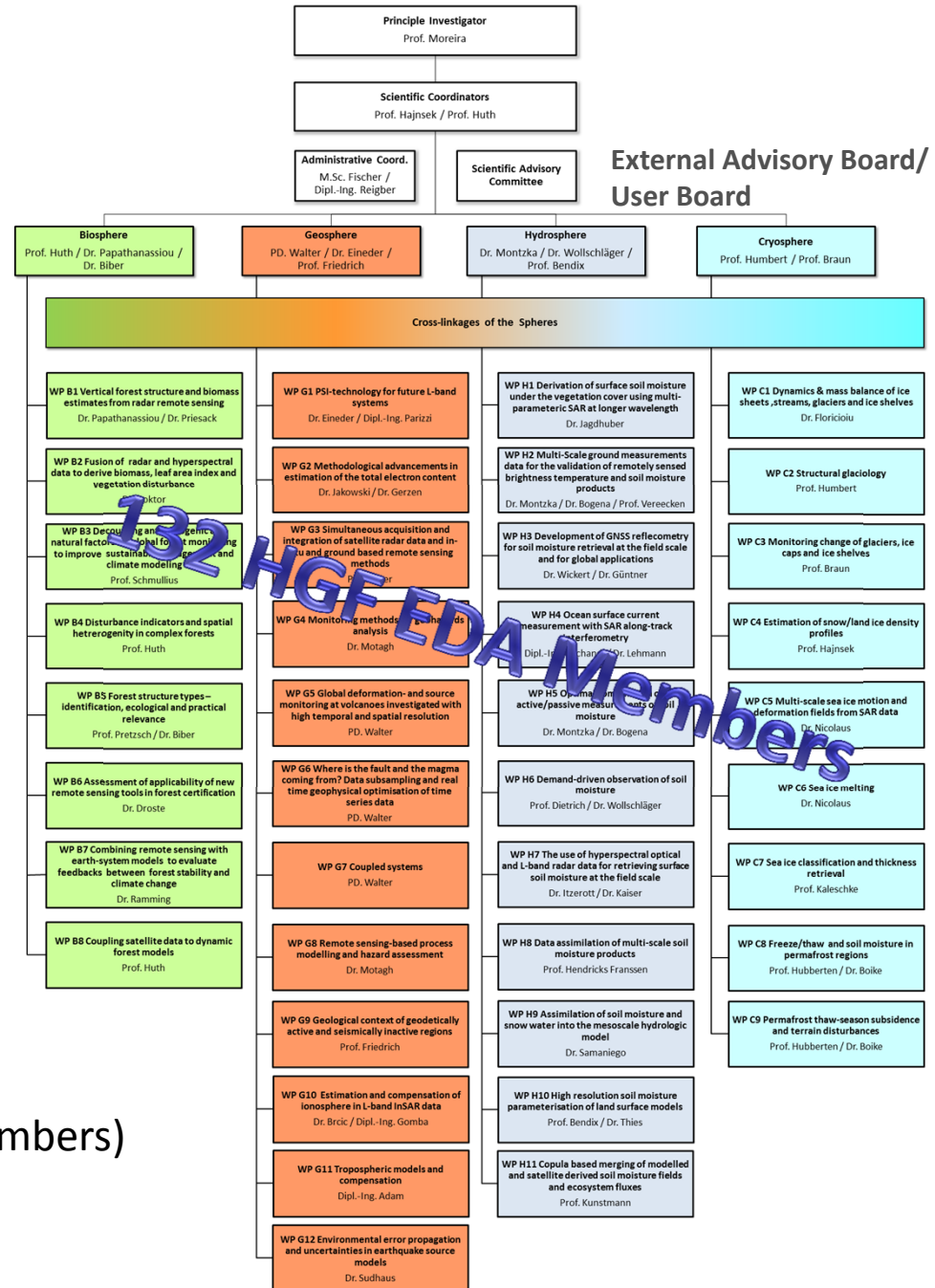
- within a work package
- within a research topic
- between research topics

## Knowledge Exchange

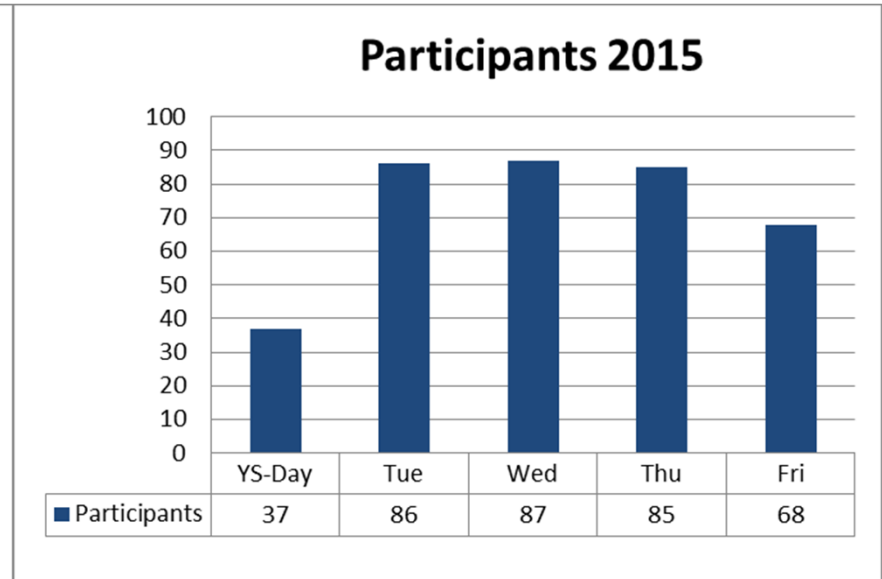
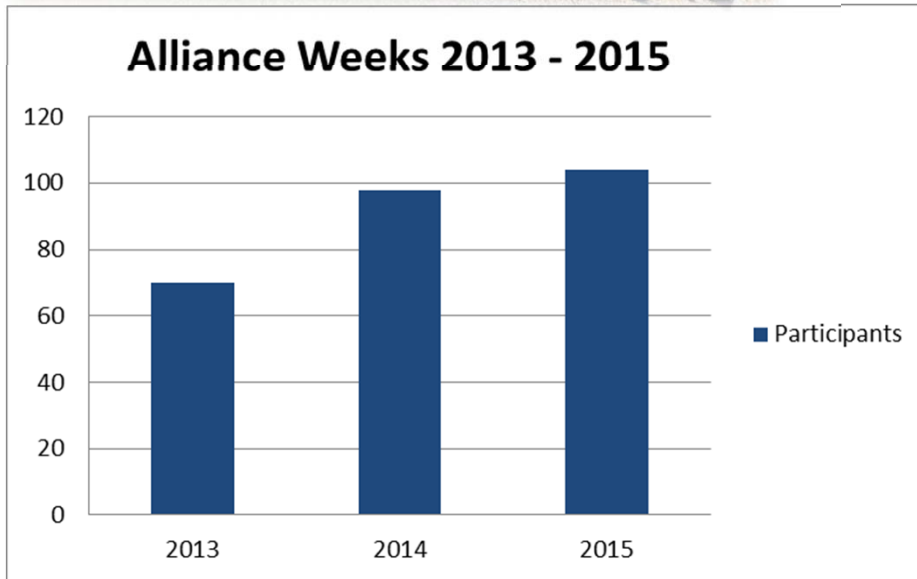
- scientific workshops (2x yearly)
- Alliance Week (1x yearly)

## Progress Reviewed

- steering committee meetings (16 members) (every 3-4 months)
- advisory committee meeting (yearly)



# Participants HGF Alliance Week: 2013 - 2015





# User Survey

## Objectives

- Presentation of the EDA product catalogue to potential users
- EDA scientists receive responses about specific user requirements

## Invited User Community

- Public authorities, insurers, environmental organizations, research institutions etc.

## Launch of the questionnaire

- Late 2015



PRODUCTS	SCALE	SPATIAL RESOLUTION	ACCURACY	TEMPORAL RESOLUTION			
Grounding Line Position	Antarctic and Ice tongues in Greenland	30 m x 30 m	-	seasonal			
Ice Sheet Elevation Change	Global	50 m x 50 m	20%	6 months			
Ice Sheet and Ice Cap Extend	Upper Canopy Height	Large Scale Deformation	Global	100 m x 100 m	1 mm (after 5 years)	twice a year	
Ice sheet and Glacier Retreat / Extension Rates	Upper Canopy Height Change	Earthquake	PRODUCTS	SCALE	SPATIAL RESOLUTION	ACCURACY	TEMPORAL RESOLUTION
Surface Melt Extend	Upper Canopy Height Change	Earthquake	PRODUCTS	SCALE	SPATIAL RESOLUTION	ACCURACY	TEMPORAL RESOLUTION
Glacier Velocity	Forest Structure	Volcanoes	Soil Moisture	Local	50 m x 50 m	5 - 10%	up to 4 x per week
Calving Rates	Forest Structure	Landslides	Soil Moisture Change	Local	50 m x 50 m	10% (of the change)	up to 4 x per week
Ice Berg Transport	Forest Structure Change	Urban Subsidence	Water level change	Regional	50 m x 50 m	10 cm	on demand
Sea Ice Extend and Concentration	Above-Ground Biomass	Regional	Ocean Currents	Regional	100 x 100 m	0.1 m/s	weekly
Sea Ice Type	Above-Ground Biomass	Global	Coastal line mapping	Global	10 m x 10 m	-	yearly
Sea Ice Melt Pond Concentration	Above-Ground Biomass Change	Regional	Wind speed velocity	Global coastal regions	100 m	1.5 m/s	every opportunity
Sea Ice Drift	Above-Ground Biomass Change	Regional	5 t/ha to 30% of the change	5 t/ha to 30% of the change	50 m x 50 m	10%	yearly
Permafrost Extend	All Permafrost regions	10 m x 10 m	10%	seasonal			
Surface Deformation	All Permafrost regions	100 m x 100 m	1 mm (after 5 years)	twice a year			
Active Layer Extend	All Permafrost regions	50 m x 50 m	10% of the change	Once per season			

# Homepage

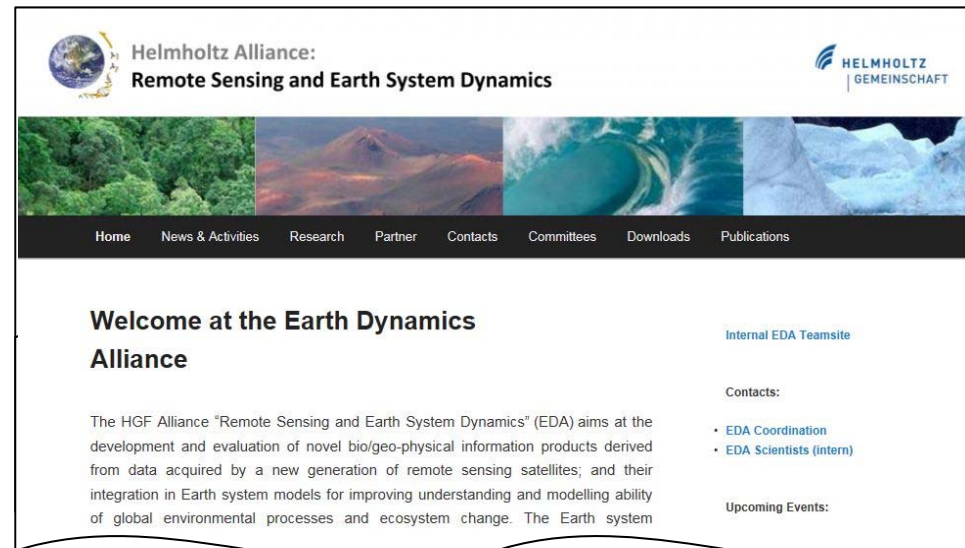
<http://hgf-eda.de/>

## Active Components:

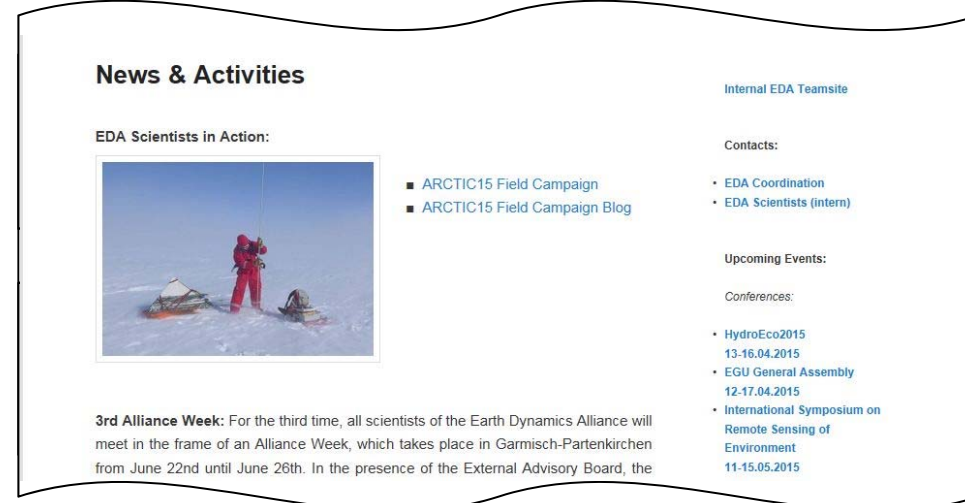
- Announcements
- Research Highlight
- Upcoming Events
- Publications

## New Components

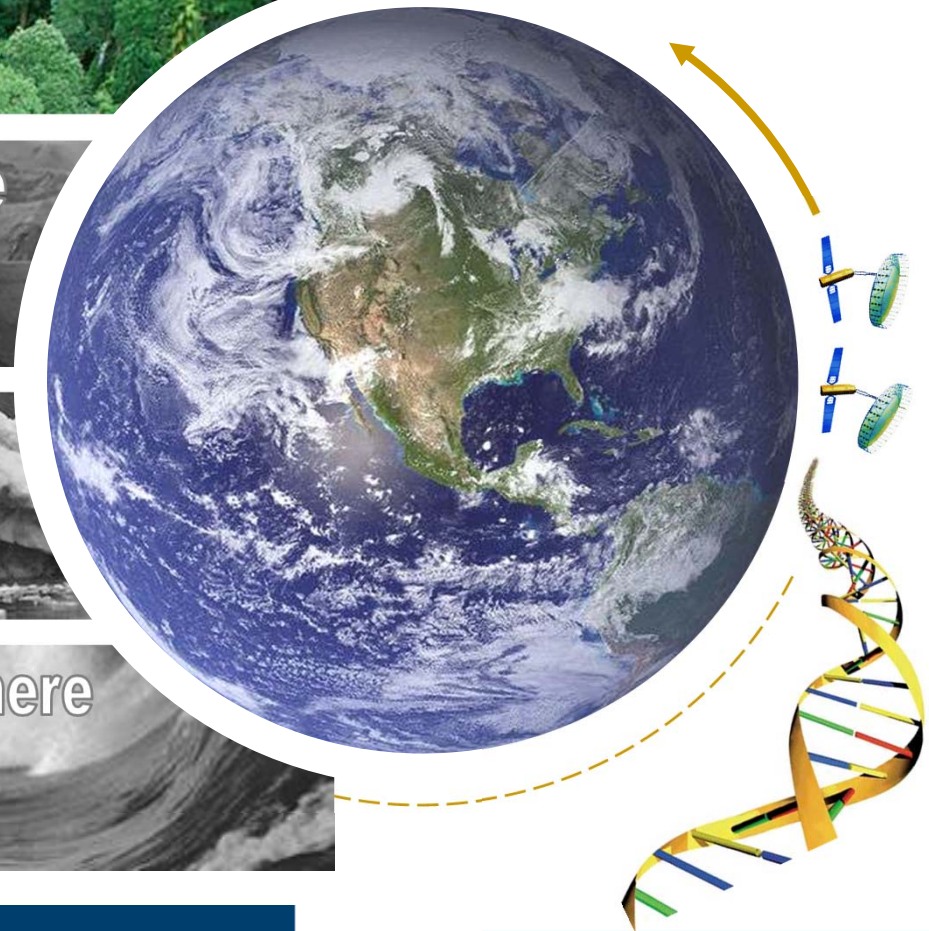
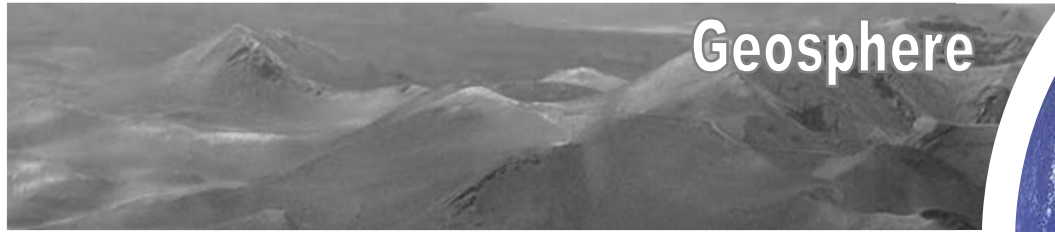
- EDA Scientists in Action
- Upcoming: Data Publication



The screenshot shows the homepage of the Helmholtz Alliance Remote Sensing and Earth System Dynamics (EDA). The header features the Helmholtz Alliance logo and the text "Helmholtz Alliance: Remote Sensing and Earth System Dynamics" on the left, and the Helmholtz Gemeinschaft logo on the right. Below the header is a navigation bar with links: Home, News & Activities, Research, Partner, Contacts, Committees, Downloads, and Publications. The main content area is titled "Welcome at the Earth Dynamics Alliance" and includes a paragraph about the EDA's mission. To the right of the main text are links for "Internal EDA Teamsite", "Contacts", "EDA Coordination", "EDA Scientists (intern)", and "Upcoming Events".



The screenshot shows the "News & Activities" section of the EDA homepage. The section is titled "News & Activities" and includes a link for "Internal EDA Teamsite". Below the title is a sub-section titled "EDA Scientists in Action:" which features a photograph of a scientist in a red suit standing in a snowy field. To the right of the photograph are links for "ARCTIC15 Field Campaign" and "ARCTIC15 Field Campaign Blog". Below the photograph is a paragraph about the "3rd Alliance Week" meeting. To the right of the main text are links for "Contacts", "EDA Coordination", "EDA Scientists (intern)", "Upcoming Events", and "Conferences". The "Conferences" section lists "HydroEco2015" (13-16.04.2015), "EGU General Assembly" (12-17.04.2015), and "International Symposium on Remote Sensing of Environment" (11-15.05.2015).

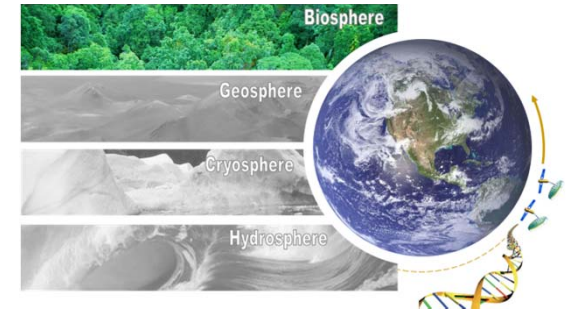


# Biosphere

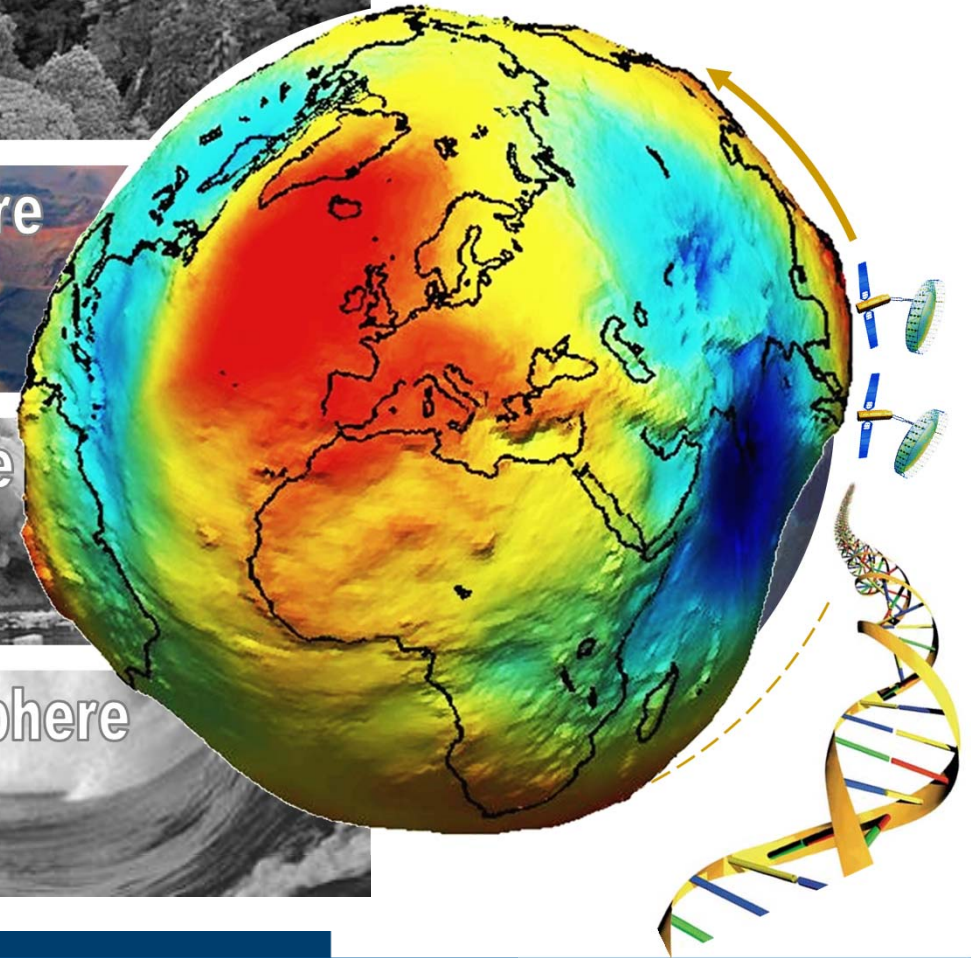
The HGF-EDA Biosphere Team

# Overarching Scientific Questions

## Biosphere



1. Which is the total amount of above-ground forest biomass and how is its spatial distribution on a global scale?
2. How is forest structure and above-ground forest biomass changing over time?
3. Where are changes occurring? Where are anthropogenic changes occurring and to which extent?
4. How is climate change affecting forest stability? How are regional climate conditions and anthropogenic factors changing forest structure and forest biomass?

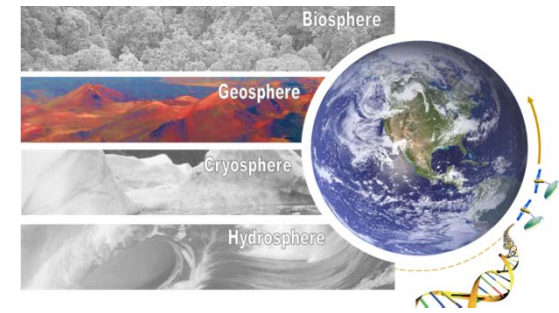


# Geosphere

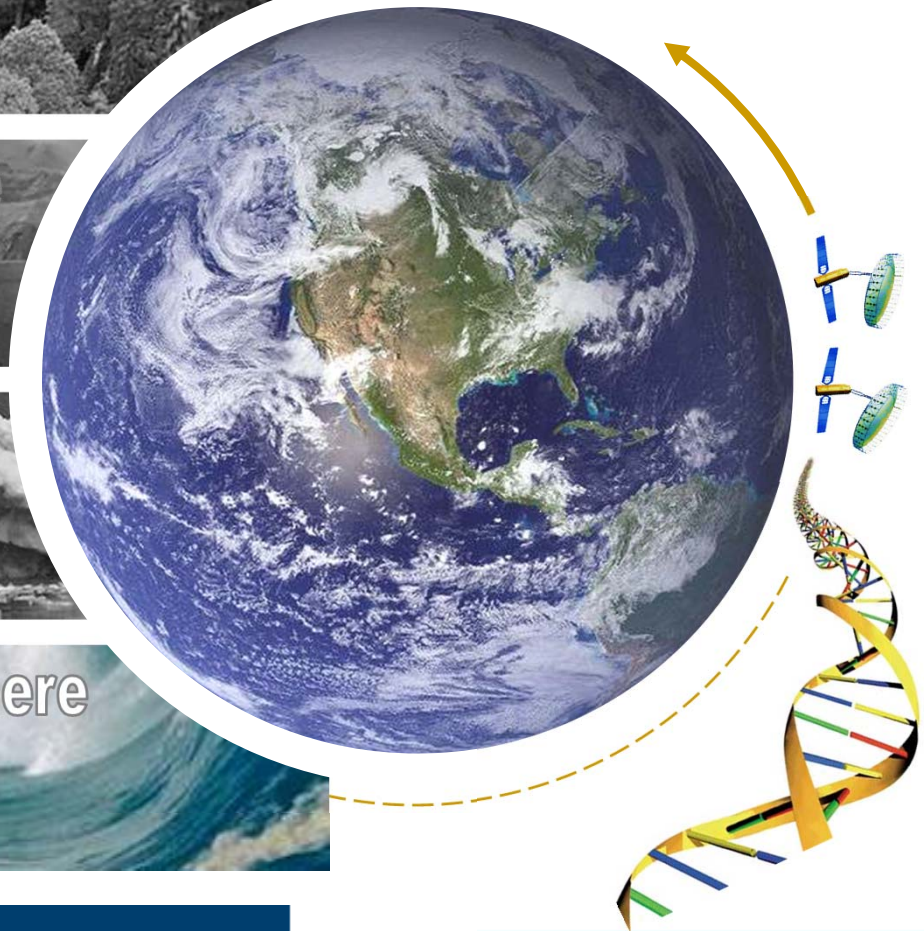
The HGF-EDA Geosphere Team

# Overarching Scientific Questions

## Geosphere



1. Is it possible to measure the strain accumulation in plate boundaries (scales  $\gg 1000\text{km}^2$ ) and by this to improve the forecast model of a specific earthquake?
2. Which are the location and extension of the rupture zones caused by an earthquake? How much energy is accumulated before, and released during an earthquake and during the postseismic relaxation?
3. Can the hazards of volcanic regions be estimated by means of the surface deformation measurement? How are volcanoes coupled to their surrounding?
4. Which influence have processes in the hydrosphere and cryosphere as well as the use of underground water reservoirs on georisks like landslide and surface deformation?

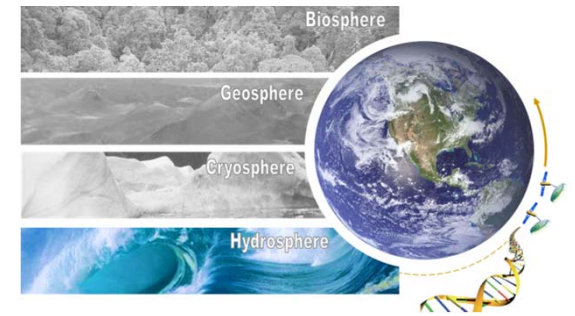


# Hydrosphere

The HGF-EDA Hydrosphere Team

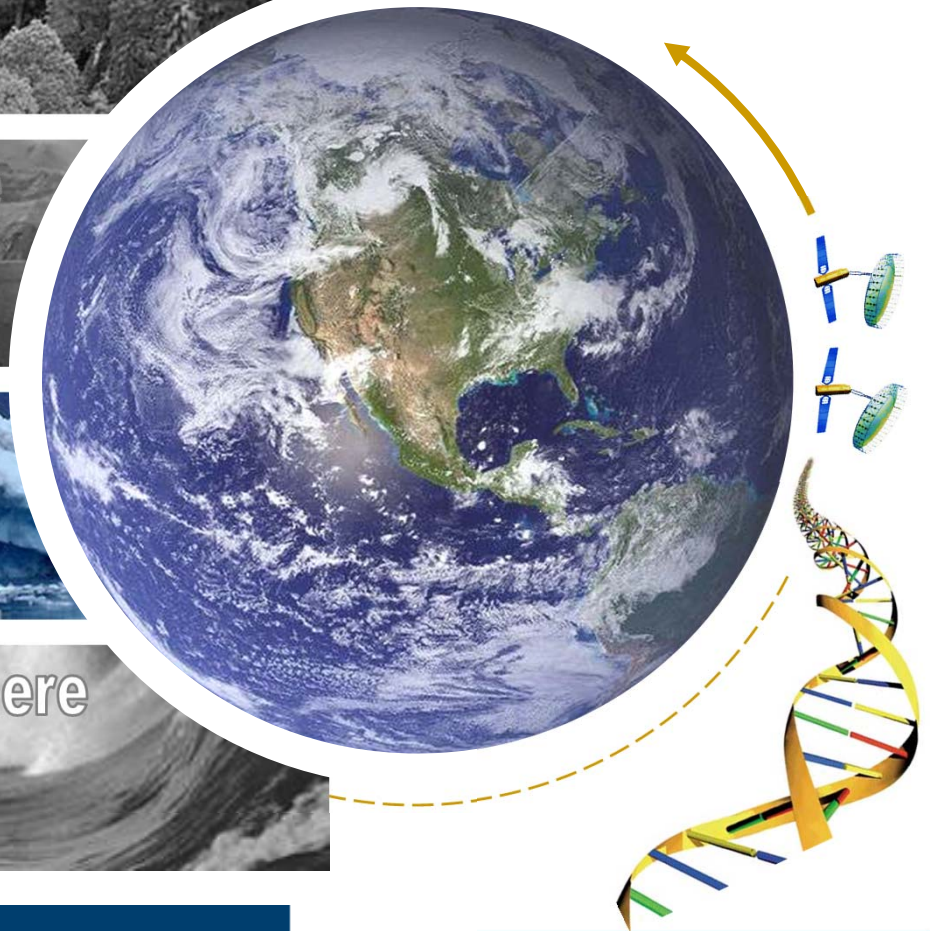
# Overarching Scientific Questions

## Hydrosphere



1. Which is the influence of soil moisture patterns on groundwater, runoff and soil water storage in meso-scale catchments?
2. How strong is the temporal and spatial variation in soil moisture coupled with regional climate (and weather) changes?
3. Which role does the spatial and temporal dynamics in soil moisture play in evaporation- and transpiration processes? How does it influence energy transport between soil and atmosphere?
4. How can near-realtime spaceborne observations help improve water cycle predictions for resource-efficient automated agricultural management (irrigation, fertilization, etc.)?



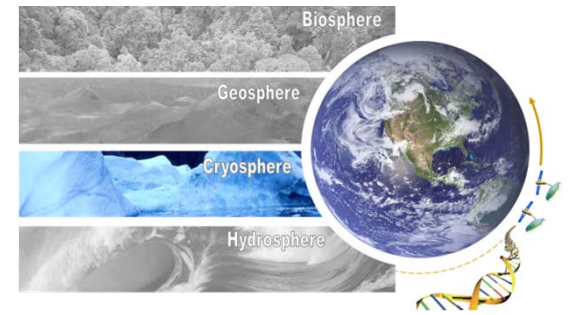


# Cryosphere

The HGF-EDA Cryosphere Team

# Overarching Scientific Questions

## Cryosphere



1. How are glaciers and ice caps changing with respect to climate change? What are the mechanisms that induce these changes and how can they be better observed and monitored?
2. Which processes drive the current mass loss of the large ice sheets? How can we reduce the uncertainties in our current quantifications of ice mass changes?
3. How are regional and global environmental climate factors changing the snow cover extent and how can we better quantify the snow water equivalent?
4. How can measurements with high spatial and time resolution improve sea ice classification as well as the modelling of sea ice rheology?
5. Where and how are permafrost areas changing over space and time? What is the contribution of permafrost to greenhouse gas emission?

# EDA in Numbers

