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CORDEX
as a foundation for Climate Services

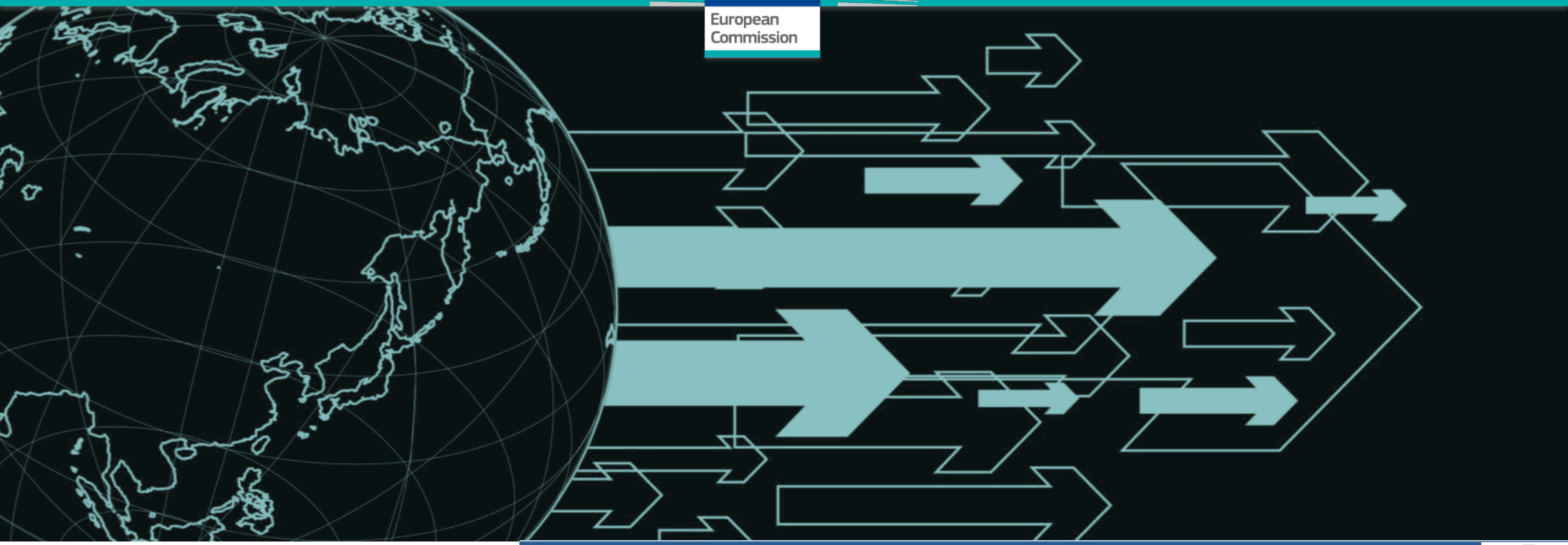
Daniela Jacob
& GERICS Team

Helmholtz-Zentrum Geesthacht
Centre for Materials and Coastal Research

GERICS
Climate Service Center Germany

A European Research and Innovation

Roadmap for Climate Services



Expert Group composition

… and support- and steering groups with EU representatives

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Roger Street, Rapporteur
Director of the UK Climate Impacts Programme (UKCIP),
University of Oxford and member of the Joint Programming Initiative on Climate

Martin Parry
Centre for Environmental Policy, Imperial College London and Department of Geography, University of Birmingh

Jesse Scott,
Member of the Gas, Coal, and Power Markets team, International Energy Agency, Paris

Daniela Jacob,
Acting Director of the Climate Service Centre 2.0,
an independent establishment at the Helmholtz-Zentrum Geesthacht, Hamburg

Now head of GERICS

Tania Runge,
Senior Policy Advisor, Copa-Cogeca secretariat
Chair of the Stakeholder Advisory Board of FACCE JPI

Definition von Climate Services

Being relatively new, various definitions and interpretations exist for the concept of climate services.

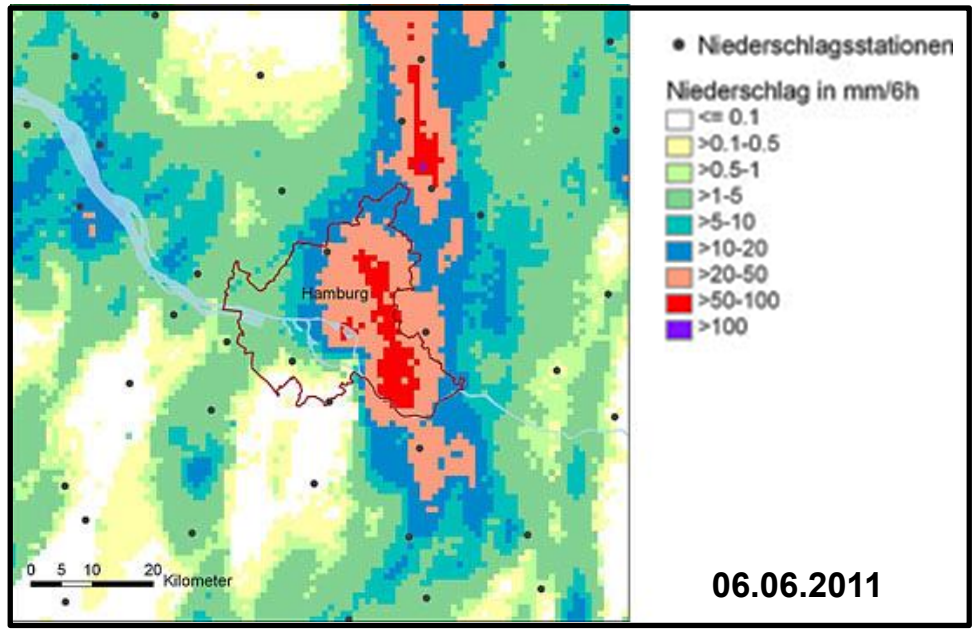
For the scope of this document, we attribute to the term a broad meaning, which covers ***the transformation of climate-related data — together with other relevant information — into customised products such as projections, forecasts, information, trends, economic analysis, assessments (including technology assessment), counselling on best practices, development and evaluation of solutions and any other service in relation to climate that may be of use for the society at large.***

As such, these services include data, information and knowledge that ***support adaptation, mitigation and disaster risk management*** (DRM).

aus: EC Directorate-General for Research and Innovation (2015):
A European research and innovation Roadmap for Climate Services - Box 1

Cities and communities: Heavy rain and flooding

Central Station Hamburg, 06.06.2011 (P. Becker)



Precipitation monitoring stations in and around Hamburg
(T. De Paus et al. 2011)

Risk: Increase in (urban) flooding events

Problem: local event, precise location is not predictable

⇨ Change in “drainage philosophy” required:
from **security promise** towards **risk management**

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Critical Infrastructure: Major damages due to weight of snow and ice

Power pole in eastern Thuringia
dpa_kreiszeitung.de, 09.12.2010

Power pole near Münster
Sueddeutsche.de, 04.12.2005

Where and how often?

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Railways: Major damages due to erosion and track melting

Water undermining near Wasserburg (May 2013)

http://www.pro-bahn.de/wasserburg/pbp_1305.htm

- Calculated restoration costs up to 700.000 Euro

Melting of tramway track in Essen (July 2015)

Foto: ANC-NEWS
http://www.derwesten.de/panorama/hitze-laehmt-den-verkehr-gleisbett-in-essen-geschmolzen-id10844539.html/

- Clogging of bitumen clumps, widely spread
- Partial closure of tram route
- All lines delayerd
- Repair works for several days
- Costs for repair and cleaning

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Roads: Major damages due to floods and heat

Flooded road in southern Sweden (2013)

© Eva Liljegren, Trafikverket. European Environment Agency:Adaptation of transport to climate change in Europe, Report No 8/2014 , S. 35

- Possible damages reported by the Swedish roadservice: Landslide, flooding of roads and bridges, collapse danger

Heat damage on road surface A93 in Bavaria (June 2013)

http://www.focus.de/fotos/die-hitze-hat-die-fahrbahndecke-der-autobahn-93-an-der_mid_1315427.html

- Motor cyle accident, one dead.
- Similar situation in 2015: Speed limit reduced to 80 km/h

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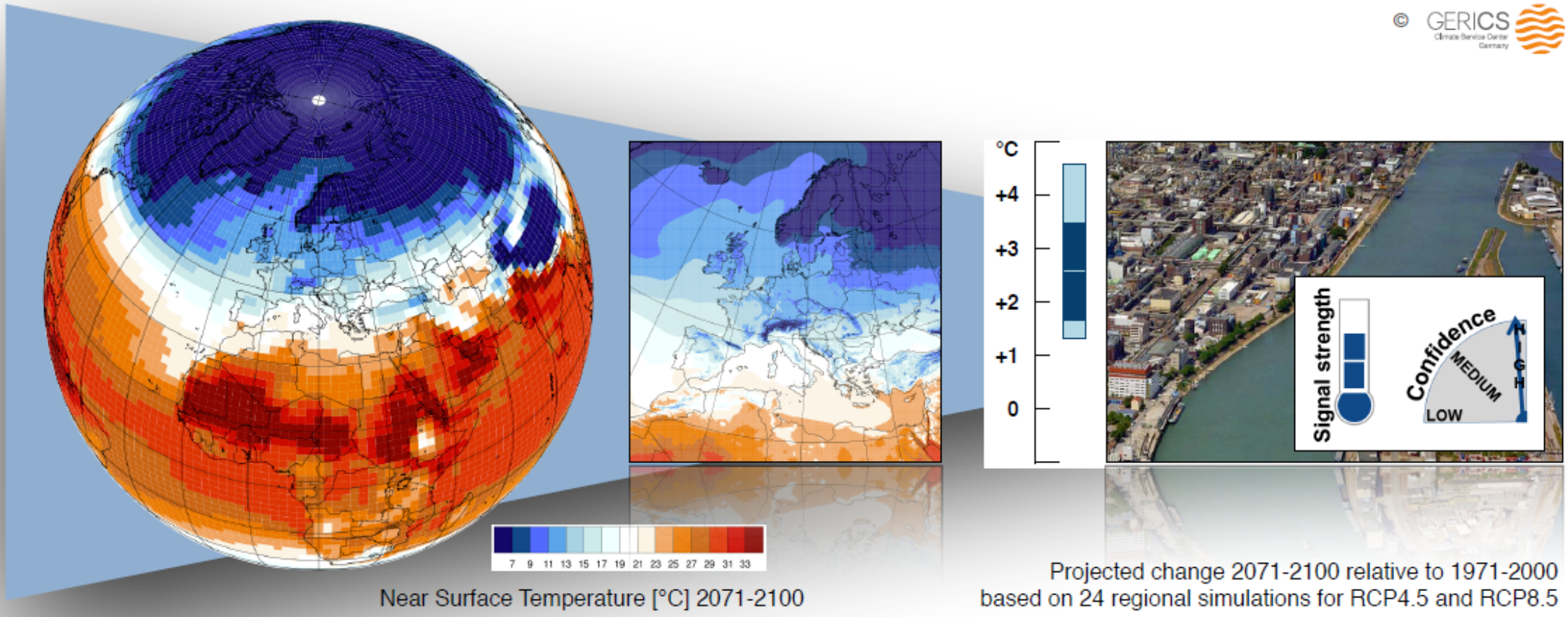
Adaptation options require climate information at the local scale



Global Simulations
~ 200 km resolution

Regional Simulations
~12 km resolution

BASF production site Ludwigshafen
Site-specific climate analysis

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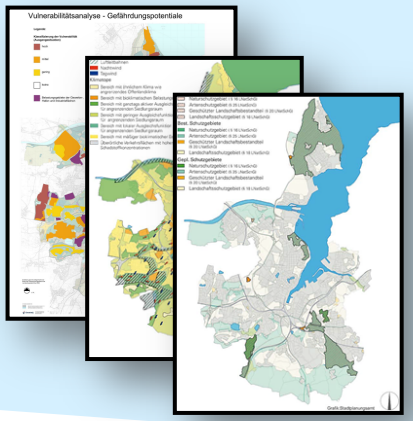
Climate adapted urban development

Climate-adapted Urban development

City
Climate adapted Urban development



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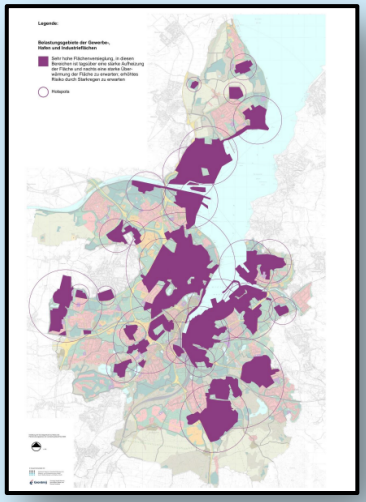
Hot-Spot-Map



City + GERICS
Proposals for action

climate adapted urban planning

climate adapted compensation measures

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reg. climate data **CORDEX**

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prototype develop-ment

Framework conditions:
land use plan,
development plan (building code)

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Requirements of decision makers (regarding regional climate modelling)

- **High spatial resolution**
  - e.g. a single street (~1 km and below)
- **High time resolution**
  - e.g. 5 minutes (Heavy precipitation, wind extremes, …)
- **Estimation: Robustness of simulation results**
  - Information on the range (Multimodel – / Multiscenario results)
- **Multiple Nesting**
  (global ~100 km → regional ~10 km → local ~1 km)
  as Input for high-resolution Impact Models

Users need climate change information on local levels

- Detailed climate information must be available → Non-hydrostatic climate change simulations
- Simulations must include local feedback processes → coupled simulations, e.g. land use change, coupled atmosphere-ocean-modeling

Statements on the robustness of projected changes are necessary

- Running of multi-model (global/regional), multi-scenario, multi-realization and multi-method ensembles → **CORDEX**

→ **Both demands result in high computing time requirements and community efforts**

EURO-CORDEX

European branch of the WCRP CORDEX initiative

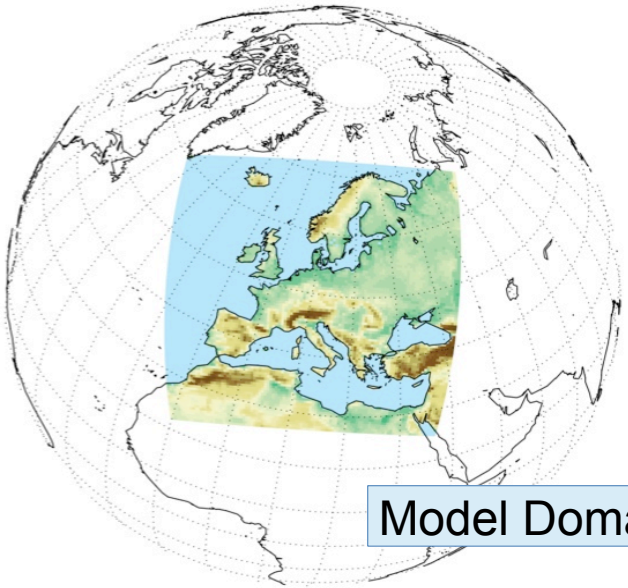
Model domain

- Horizontal resolutions: 12.5 km and 50 km
- Scenarios:
  - RCP 4.5, RCP 8.5 (focus)
  - RCP 2.6 (so far: few simulations)

Community

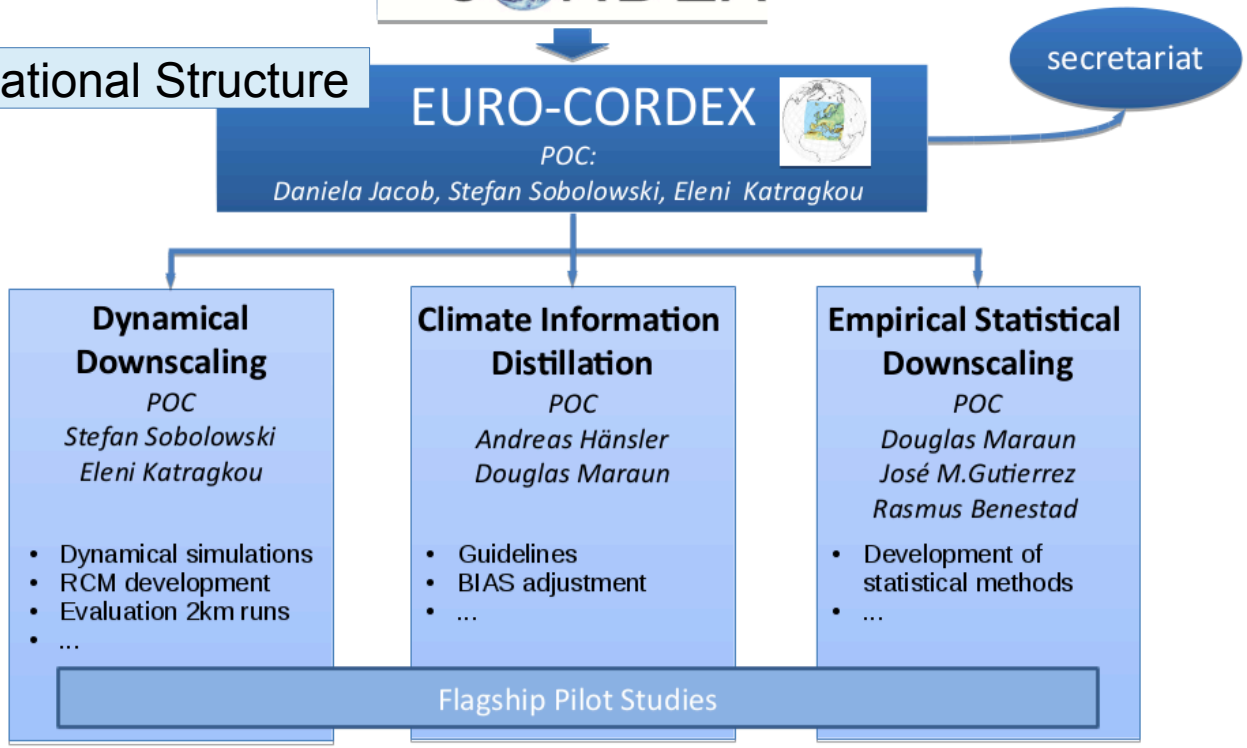
- 29 actively contribution groups
- Leading institutions in the field of regional climate modeling in Europe
- Voluntary effort, contributions are funded by the contributors

62 scenario simulations at high resolution (EUR-11, 12.5 km):
16 planned, 4 running, 42 finished (31 simulations published)



Model Domain

Organizational Structure



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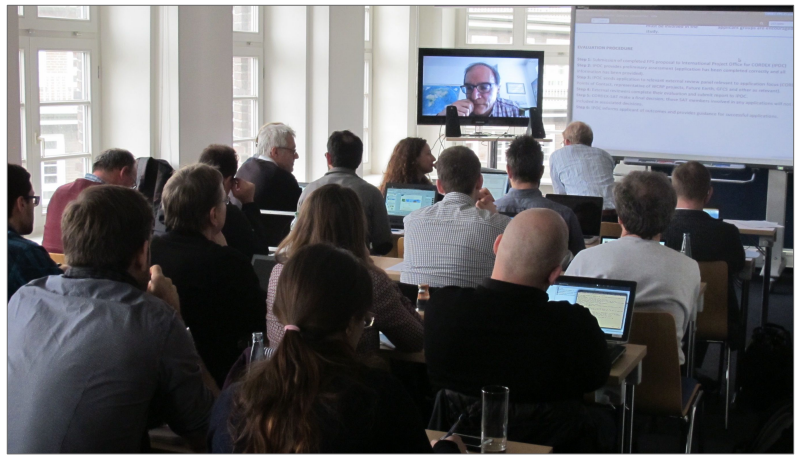
6th EURO-CORDEX General Assembly im GERICS *(25.01.- 27.01.2016)*

- Exchange of latest scientific knowledge
- Planning: model simulations, data transfer, scientific studies
- Interface to Users, Organisational structure
- Development of regional models
  - → higher resolution
  - → additional components (Advanced land surface schemes)
- about 40 international participants



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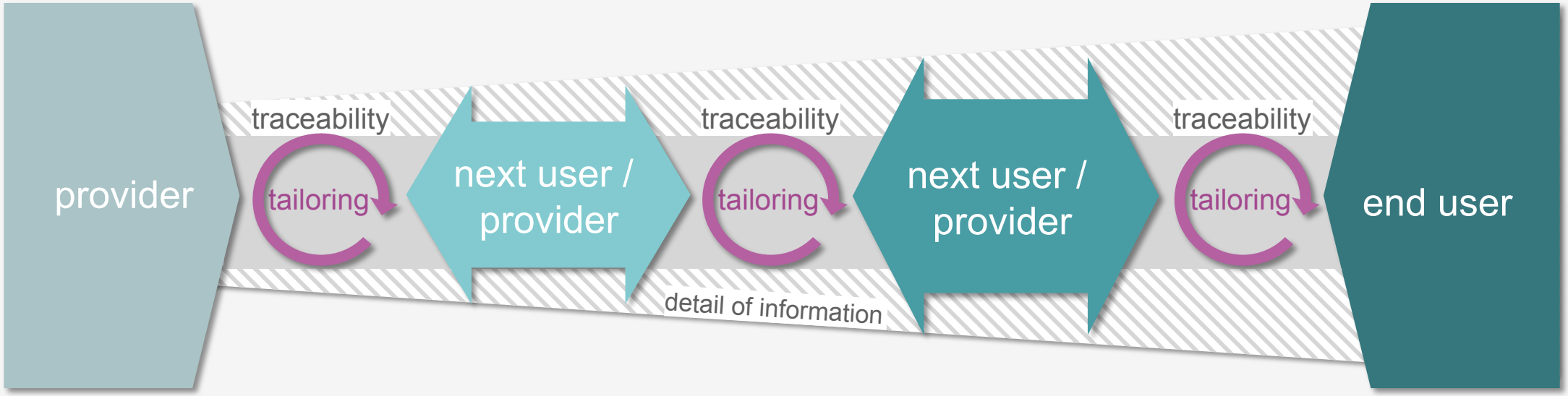
The next-user 'chain': a common concept



MEASUREMENTS / SIMULATIONS

satellite, airborne and ground-based observations

re-analyses

climate simulations

CLIMATE DATA PROCESSING

climate data records

data assimilation

ensemble simulations/ post-processing/ analyses

impact modellling

CLIMATE INFORMATION

confidence analysis

extracting decision relevant knowledge

co-development of prototypes

PRODUCTS

application of user-tailored products by decision makers, public, media

I2C web atlas

Climate Fact-sheet

Climate signal map

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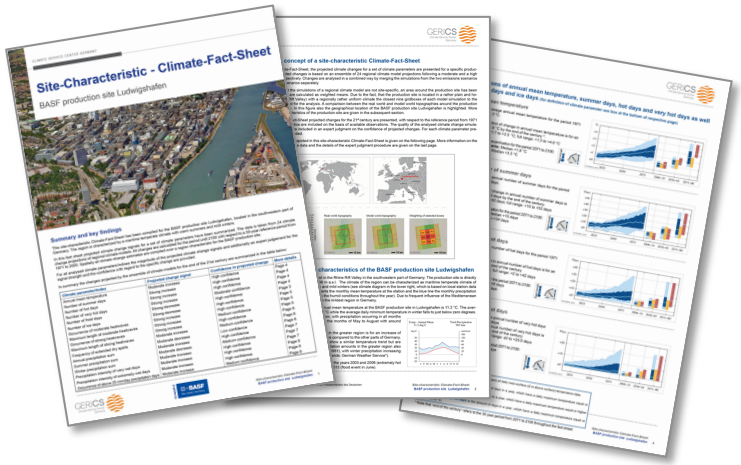
Assessing bandwidth and uncertainty

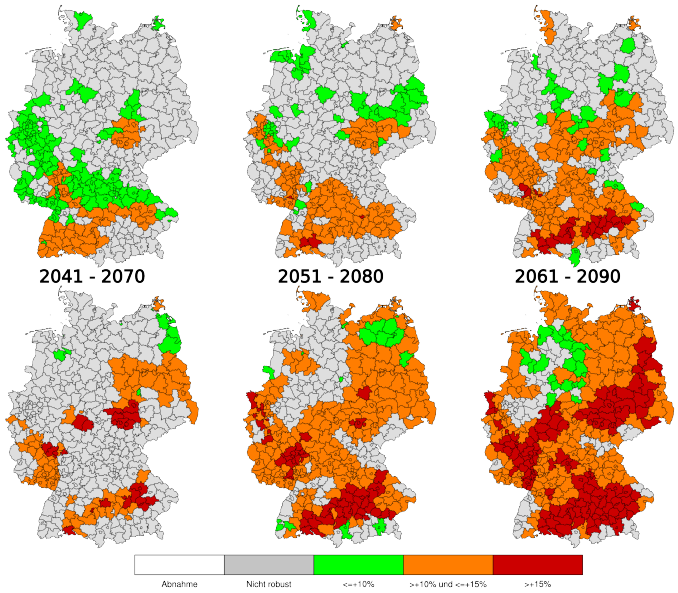
- Multi-model multi-scenario ensembles of high resolution regional climate change projections are required -> CORDEX; EURO-CORDEX; national contributions to CORDEX
- Adequate preparation and communication of user-specific information are essential

Site-characteristic Climate-Fact-Sheet



- Developed in 2015 jointly with BASF for production site Ludwigshafen
- Based on an ensemble of EURO-CORDEX projections

Climate Signal Maps



Pfeifer et al., 2015

- Tool to highlight **robust** climate change signals

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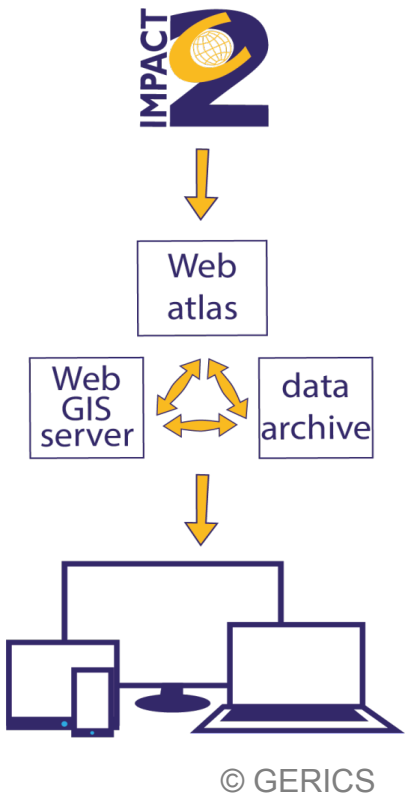
The IMPACT2C Web-Atlas



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- web-based climate service product

  based on EURO-CORDEX simulations
- disseminating inter- and transdisciplinary project results

for providers:

- Results analyzed using a consistent method
- Results presented using a coherent approach
- Rapid online-publication of project results

for users:

- access a quick overview
- access for different individual devices such as smartphones, tablets and usual desktops

See also:
Session A3: From data to information – a distillation dilemma
Wednesday 11:00
Preuschmann

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Session D1:
Climate Services in the frame of CORDEX

The aim of this session is to assess whether **CORDEX activities** and **Climate Service needs and expectations** can be **matched**. We want to **exchange experiences** of climate services in different CORDEX regions and discuss their **transferability**.

After an introduction, we will have a **keynote talk** followed by an interactive part called **world café** and selected **scientific presentations.**

- **When?**
  Thursday from **14.00 - 17.00h**
- **Where?**
  Aula Magna,
  Frescativägen 6/ Universitetsvägen 6
- **Target group?**
  All relevant CORDEX domains
- **Coordinators?**
  Daniela Jacob and **Claas Teichmann**

We are looking forward to meet you there!

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