Use case "River discharge modeling and validation"

GEOSS interoperability for Weather, Ocean and Water

3rd AfWCCI Workshop
04 - 05 Feb 2013

THEME[ENV.2011.4.1.3-1]: Inter-operable integration of shared Earth Observation in the Global Context

Duration: Sept. 1, 2011 – Aug. 31, 2014

Total EC funding: 6,399,098.00 €

Project Web Site: www.geowow.eu

Michael Nyenhuis
University of Bonn

David Richardson
ECMWF
with contributions from WP4 and WP5 partners

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GEOWOW Overview

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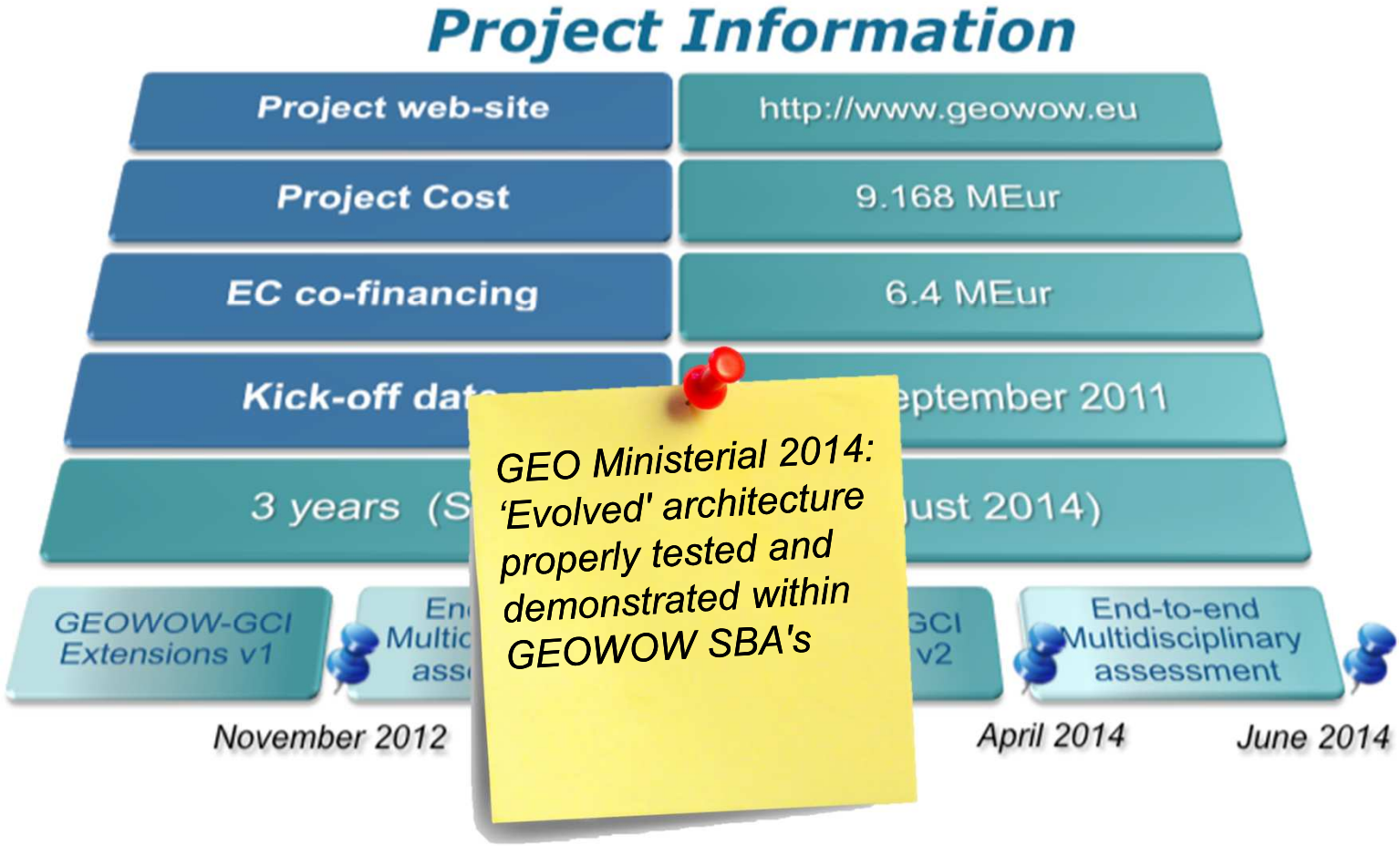


Main Objectives

- **GEOSS Infrastructure Evolution** for all stakeholders (*with a particular focus on the 'WOW' SBAs*):
  - To facilitate discovery, access and use of …
    - Data
    - Other GEO-resources
  - To allow harmonised access to heterogeneous resources
  - To promote and simplify data sharing
    - With a particular focus on the GEOSS Data CORE

Approach

GEOWOW adopts a *structured system engineering approach*:

- **User requirements** from SBAs and across SBAs

Current GCI

GROUP ON EARTH OBSERVATIONS
AIP, StP

EuroGEOSS

Thorpex

GOOS

GENESI-DEC

- **Technology base**: considering prior development efforts (current GCI, Thorpez, GOOS, EUROGEOSS, GENESI-DEC, StP, AIP, etc.) and from SBA-systems

- **Constraints and recommendations**: from relevant initiatives and standardization bodies, including GEO IIB, IEEE, OGC, INSPIRE, GMES, etc

GROUP ON EARTH OBSERVATIONS
SIF, IIB

IEEE

OGC®
Open Geospatial Consortium, Inc.

INSPIRE - Infrastructure for Spatial Information in Europe

GMES

GEOWOW Vision

- **What**: A long-term vision for **GEOSS - GCI evolution** …

  *…considering feedback from **all the stakeholders**.*

- **For whom**:
  - For a growing number of **user categories**: ranging from data providers and data specialists to multidisciplinary scientists and decision makers.
- **How**:
  - Via **a flexible architecture**:
    - with a **modular approach**, i.e. a set of interoperable component-based "GEOSS Infrastructure Evolutions" that respond to the community needs
    - enabling **different usage patterns:** different communities will benefit from the components in different manners, according to their needs and their usual working habits.
    - able to **evolve** with new components emerging from the technology landscape, however rapidly this is evolving…

Showcases

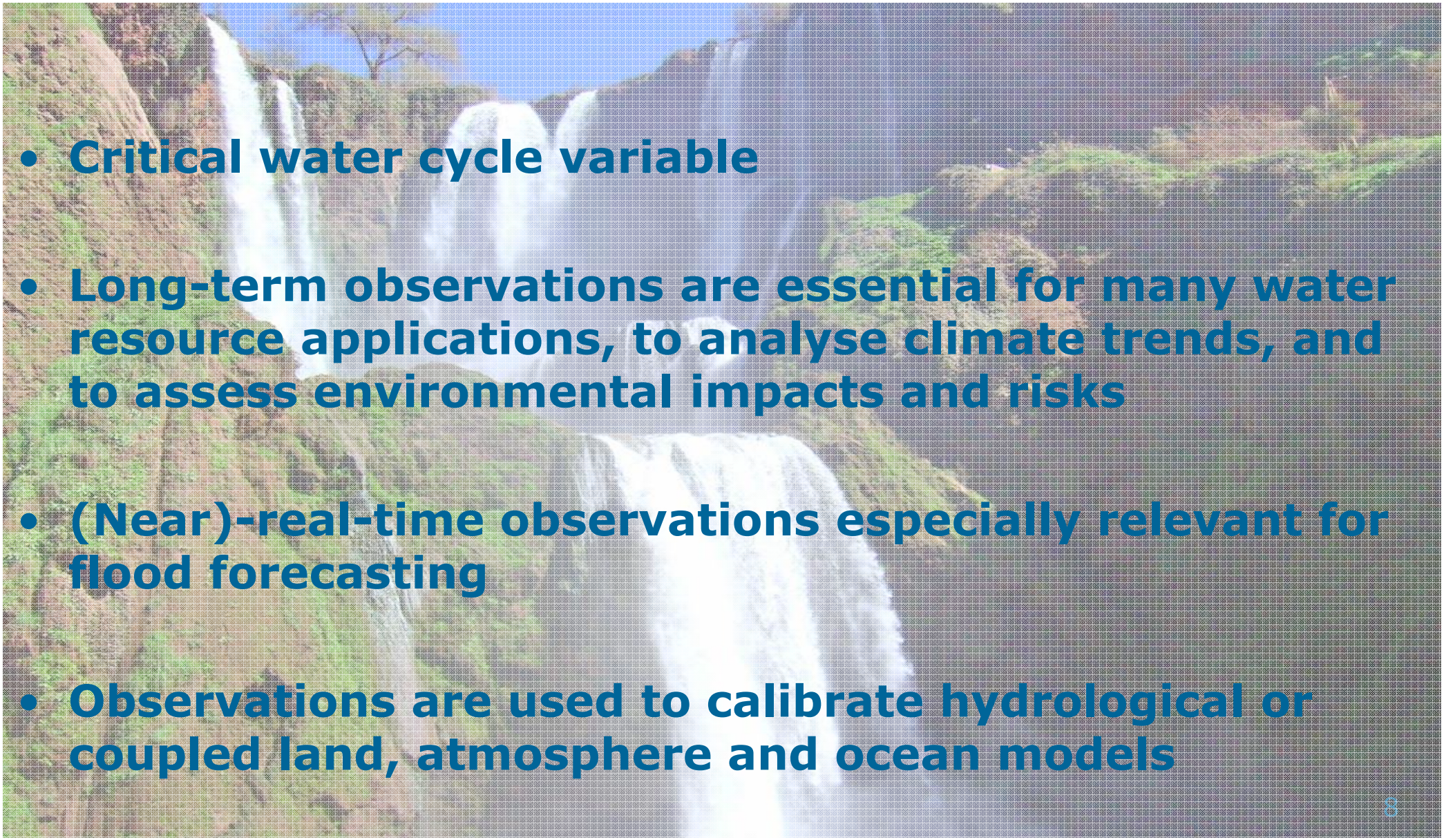
The GEOWOW proposed evolutions are being prototyped via **Showcases**. The following are examples.

#Drought - Easy discovery and use of GEOSS resources for addressing multidisciplinary challenges related to drought scenarios

#CoralReefs - A new concept of operation for elaborating environmental indicators

#RiverDischarge – Validated and calibrated forecasting workflow using Ensemble Weather Prediction Systems, a runoff model and in-situ river discharge observations

River discharge



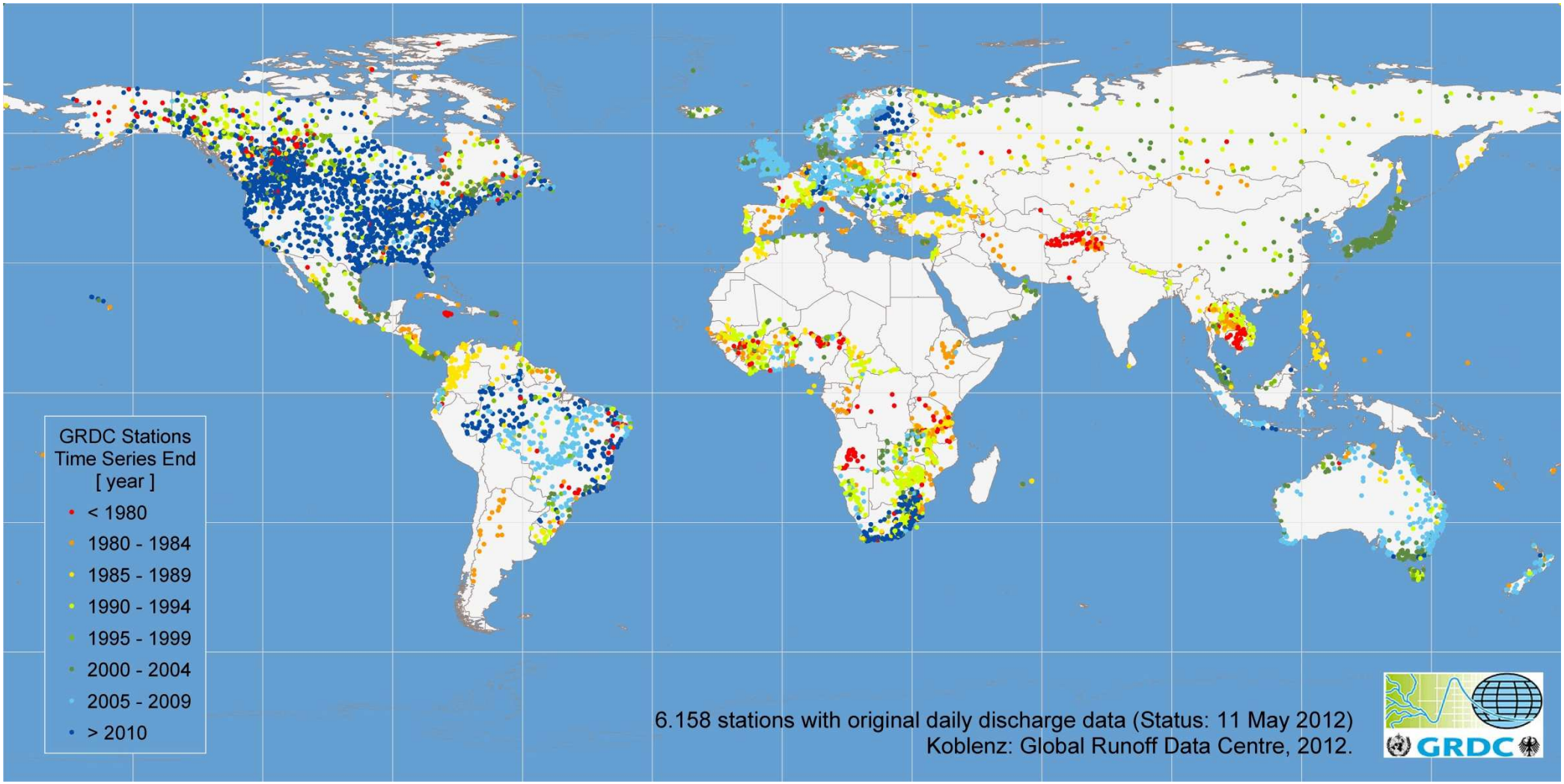
- Critical water cycle variable
- Long-term observations are essential for many water resource applications, to analyse climate trends, and to assess environmental impacts and risks
- (Near)-real-time observations especially relevant for flood forecasting
- Observations are used to calibrate hydrological or coupled land, atmosphere and ocean models

River discharge

- Under the auspices of WMO, the **Global Runoff Data Centre (GRDC)** collects river discharge data at daily or monthly intervals from more than 8400 stations in 157 countries
- Through the Global Terrestrial Network of Hydrology (GTN-H), GRDC is linked to GEOSS
- To support
  - The climate-related programmes and projects of the United Nations and their special organisations;
  - The international scientific community on global change, climate and hydrology, research and assessment.

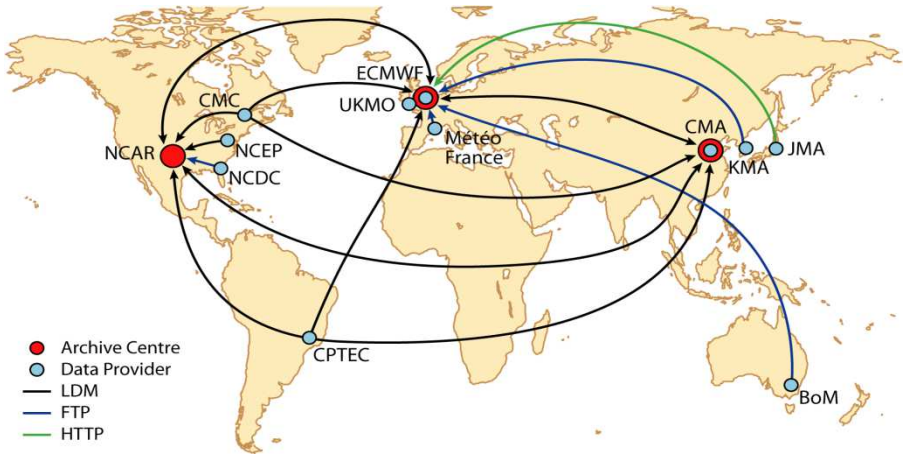
River discharge

- GRDC stations with original daily discharge data



TIGGE ensemble weather forecasts

- TIGGE, the THORPEX Interactive Grand Global Ensemble, is a collection of ensemble weather forecasts from global and regional models, available for scientific research
- The ensemble forecasts are made from slightly perturbed initial conditions to capture uncertainties stemming from the initial weather conditions and model errors
- GEOWOW will **significantly enhance the accessibility of TIGGE archive** for the wider user community, an essential requirement to exploit the substantial multi-disciplinary potential in TIGGE data



Application development and GCI components integration

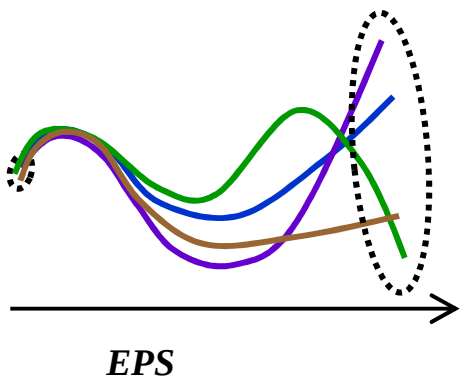
- **Weather** Societal Benefit Area (WP4):
  - Integrate the TIGGE archive into the GEOSS Common Infrastructure (GCI)
  - Improve the accessibility of TIGGE for long time series of forecast data at user-specified locations
  - Demonstrate the potential of the TIGGE archive in multi-disciplinary applications
- **Water** Societal Benefit Area (WP5):
  - Allow discovery, access, and use of GRDC data through the GEOSS Common Infrastructure (GCI)
  - Standardisation of the exchange of hydrological data (WaterML 2.0 and SOS 2.0 Hydrology Profile)
  - Towards increased multi-disciplinary interoperability to allow integration of data from different domains

Use case development

"Modeling of river discharge using weather predictions and validation based on river discharge observations"

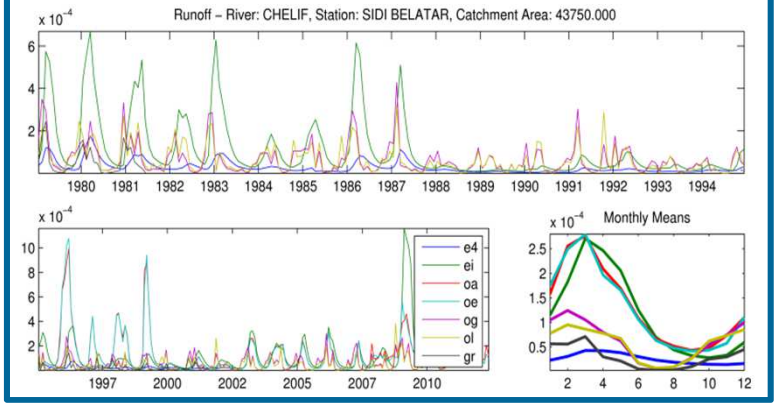
- Scenario will provide a use case (#River Discharge) for prototyping additional functionalities and GCI components
- To demonstrate the benefits of **improved interoperability** of **domain resources** through GCI evolutions

Weather prediction



Discharge observations

Validation / visualisation



Use case development

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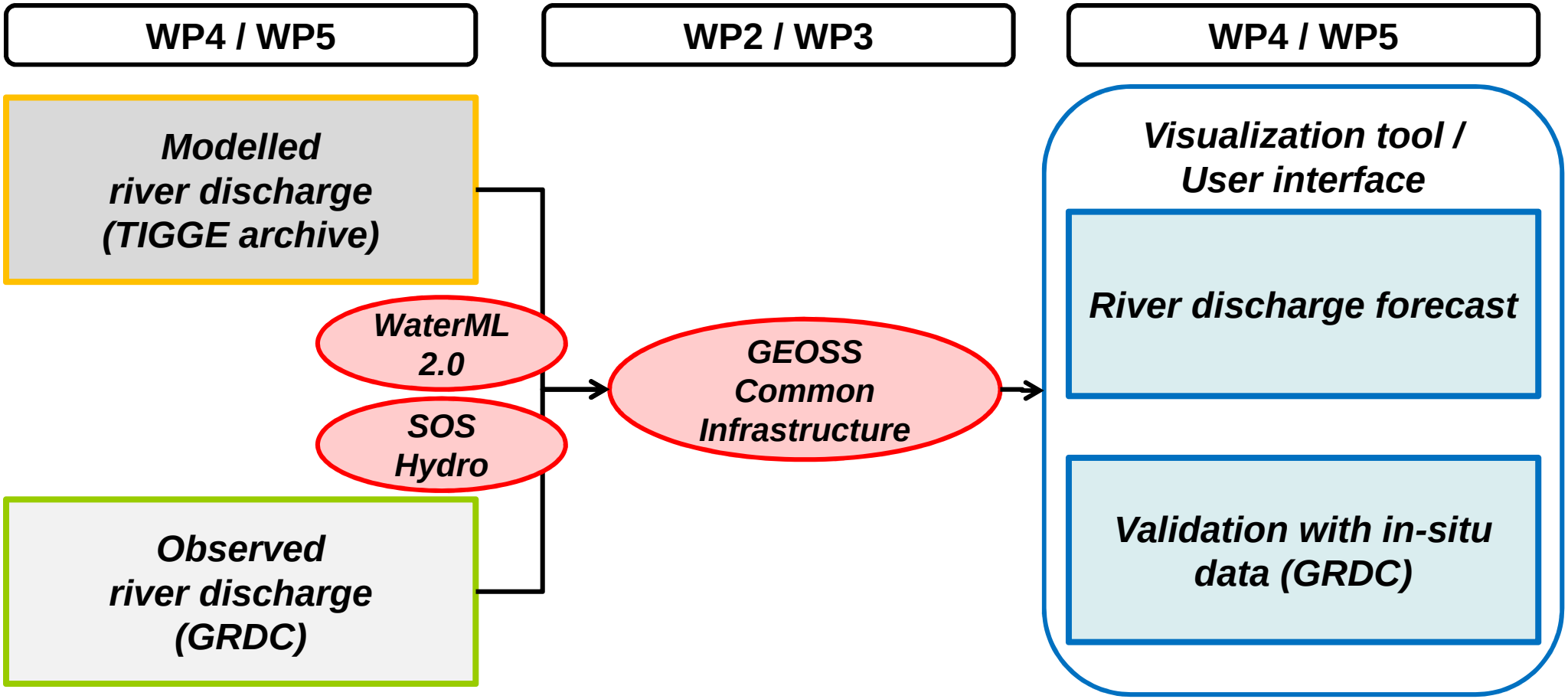
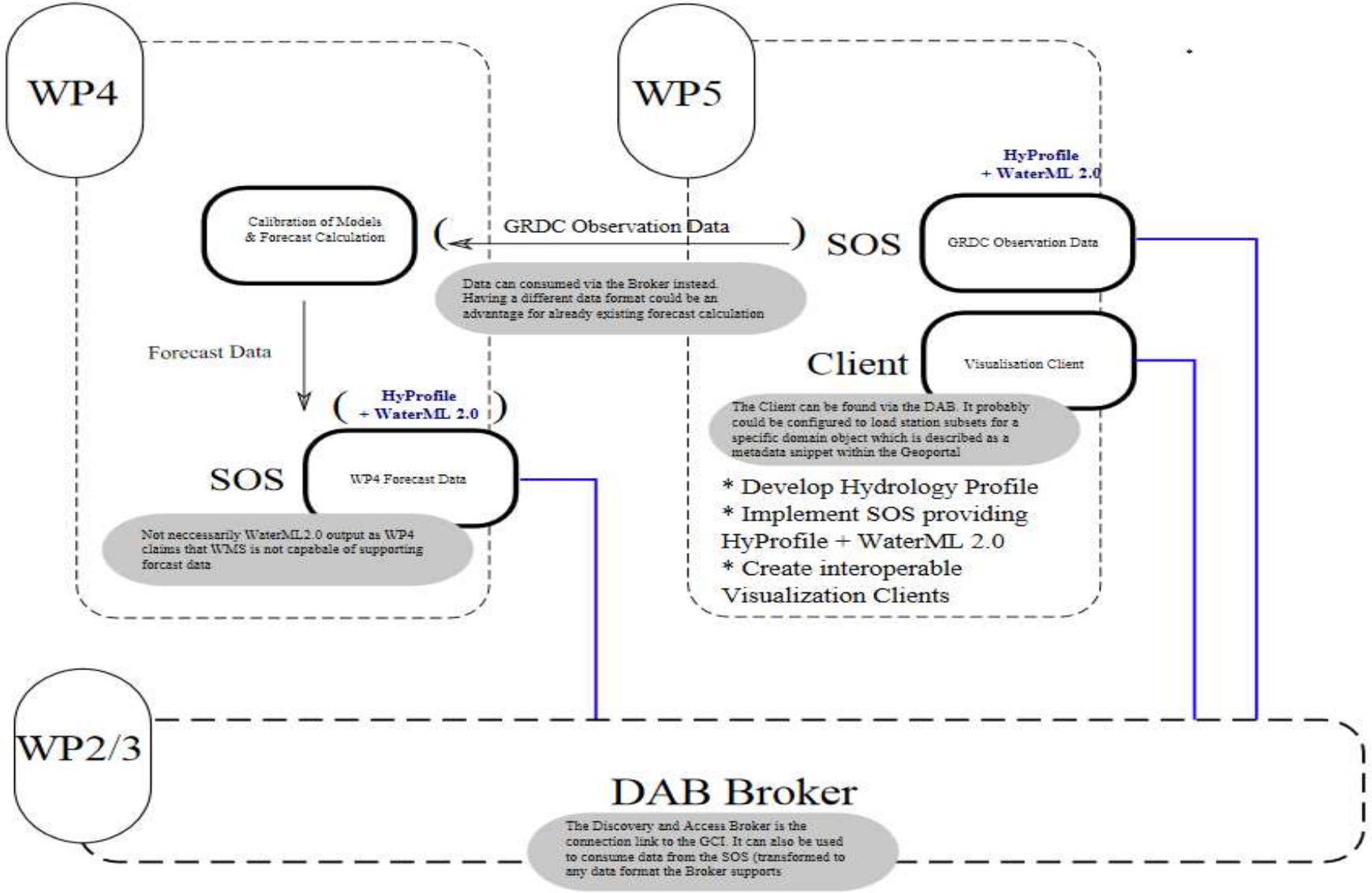


Use case development

"Modeling of river discharge using weather predictions and validation based on river discharge observations"

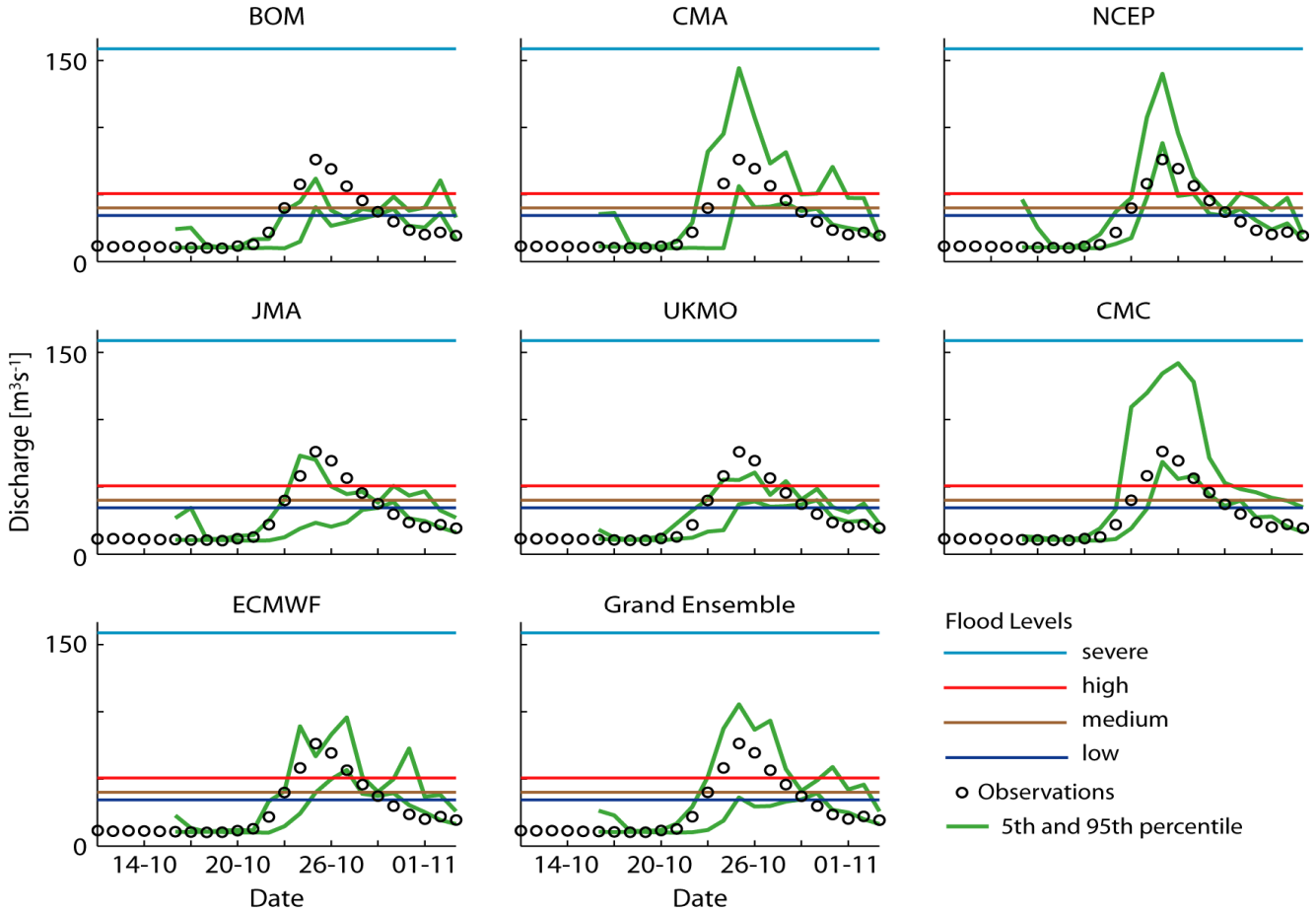
- Development, validation and calibration of **forecasting workflow** using Ensemble Prediction Systems (EPS) of Numerical Weather Predictions (NWP) and a runoff model and river discharge observations
- Availability of river discharge forecasts from the **TIGGE archive**
- Enlarged availability of **GRDC/GTN-R discharge data**
- **Enhanced GCI** to enable interoperable exchange of (hydrological) observation data by **linking the GCI to Sensor Web data formats**, models, and interfaces (e.g. WaterML 2.0 and the Sensor Observation Service (i.e. hydrology SOS profile)
- **GCI based visualisation** of discharge forecasts and observations in combination for different forecast ranges, different river catchments, and different ensemble models

Showcase development



Achievements - Weather

- Test computations with river discharge based on TIGGE



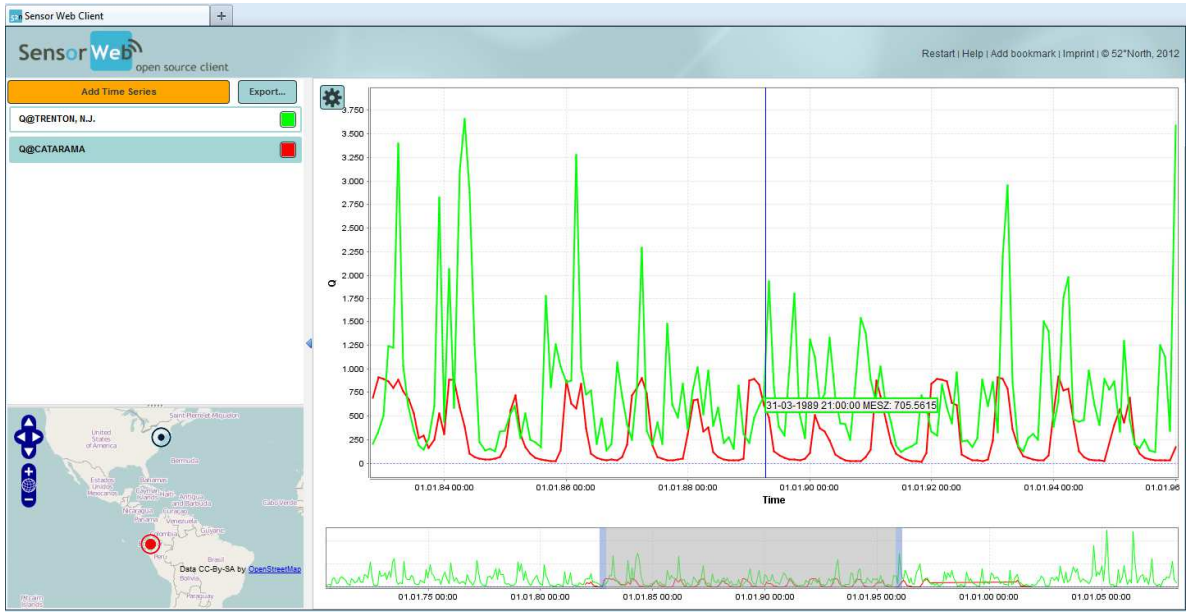
- First feasibility studies of using the SOS system and coding the river discharge forecasts in WaterML 2.0 format

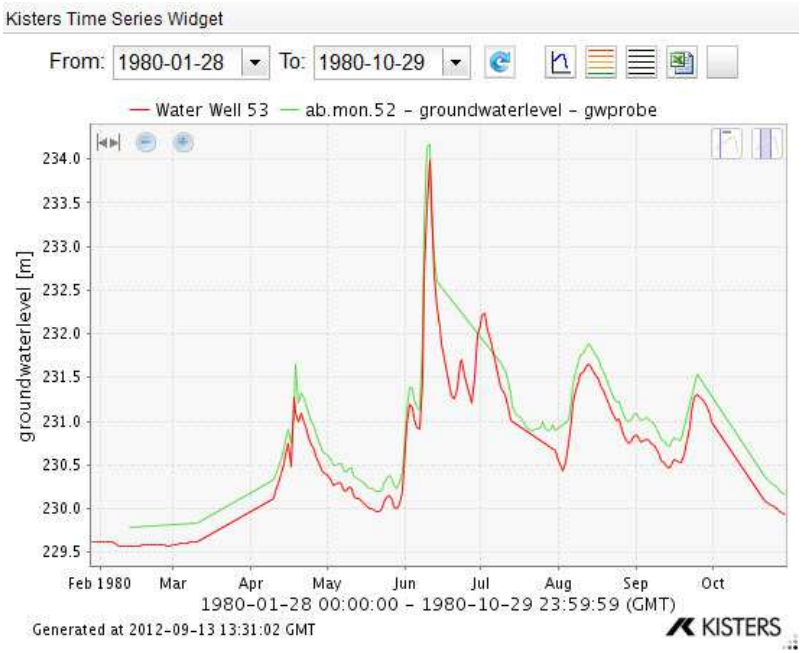
Achievements - Water

- Development of OGC SOS Hydrology Profile: optimised interface to access WaterML 2.0 encoded data
- Provision of server and client implementations by two project partners:

52north exploring horizons

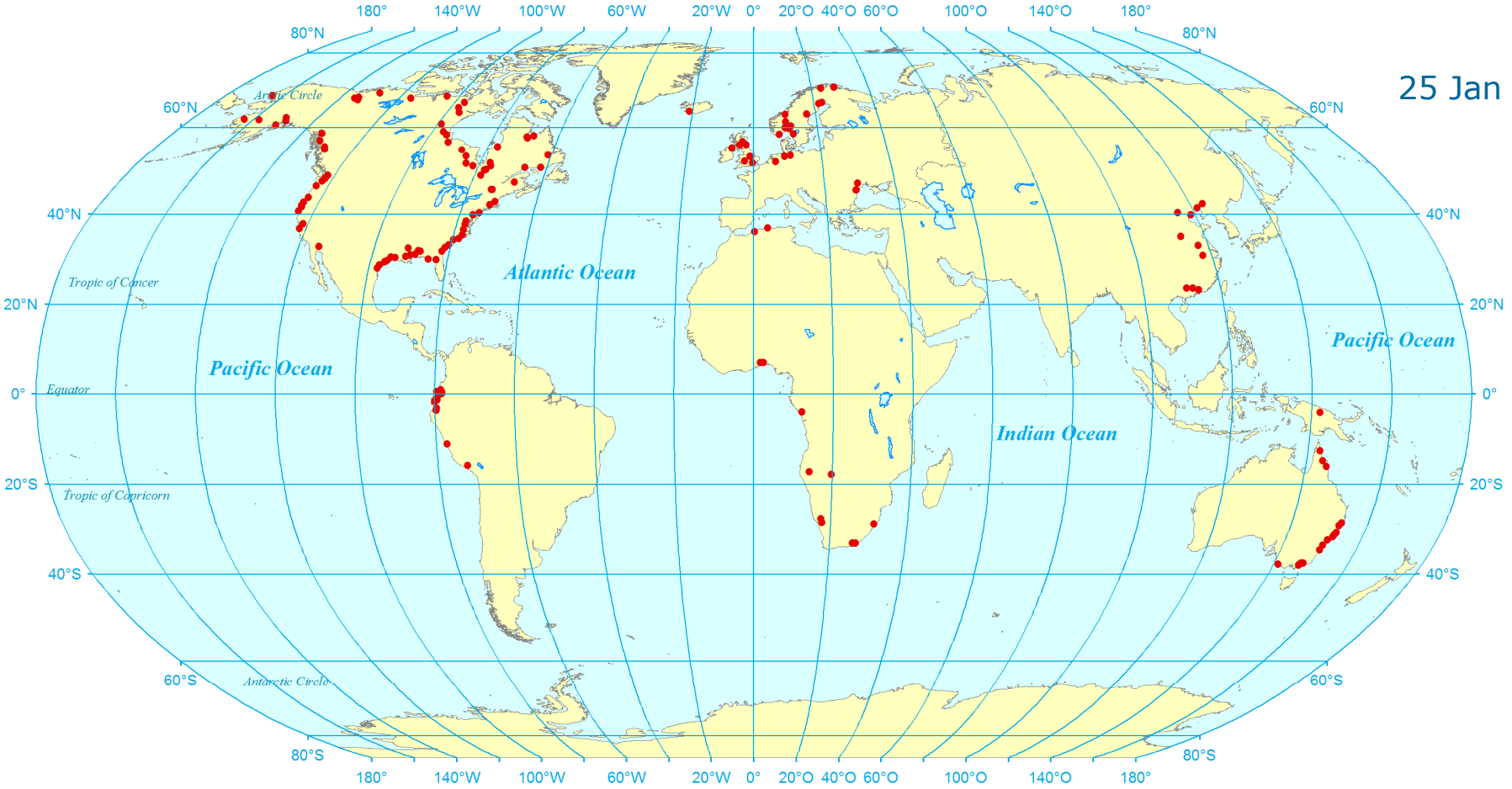
KISTERS





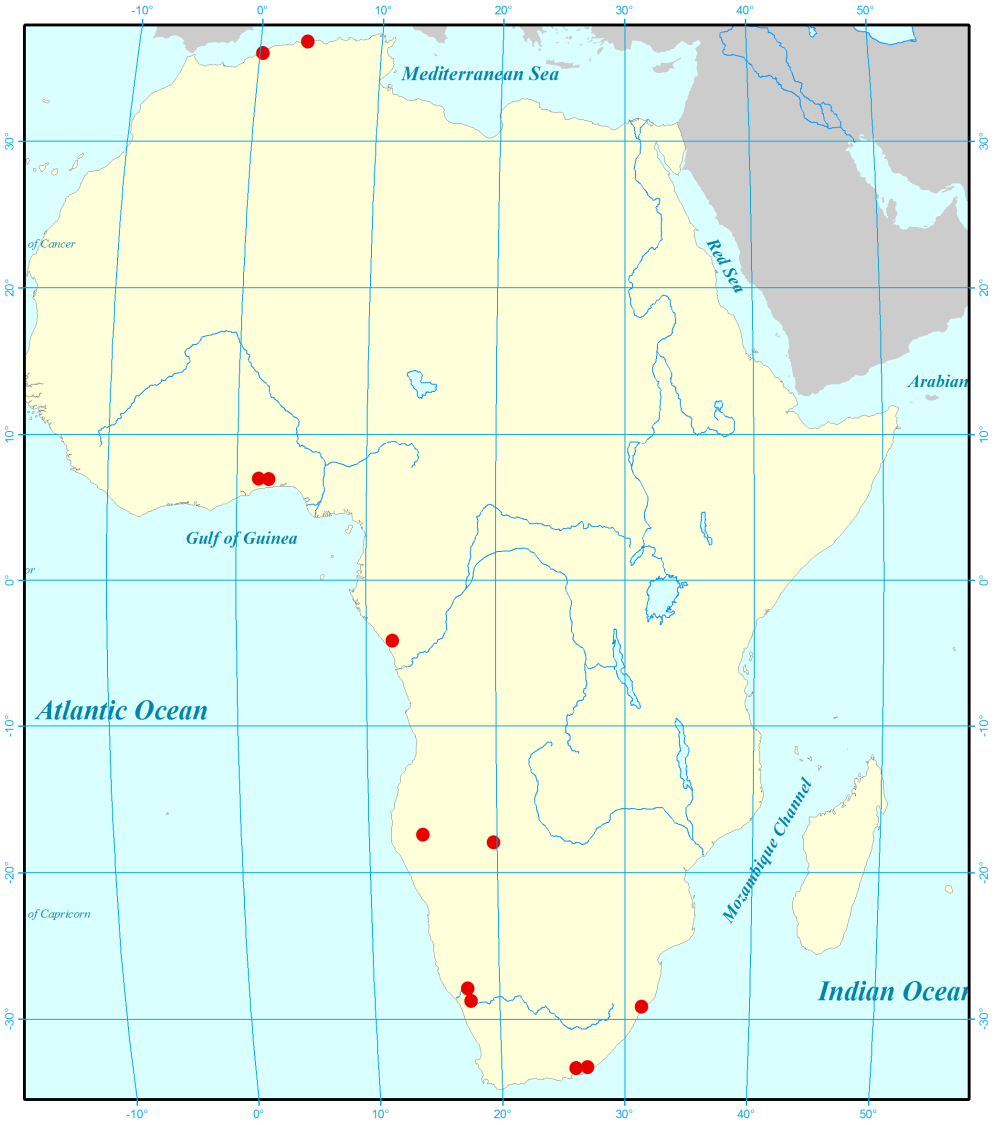
Achievements - Water

- Initial selection of 162 GRDC stations for GEOSS data-CORE
- On-going efforts to make more stations accessible



25 Jan 2013

Achievements - Water



- 12 Stations in Africa (25 Jan 2013)

Country	Number of stations
Algeria	2
Benin	2
Congo	1
Namibia	3
South Africa	4

- Develop useful case studies in Africa to demonstrate
  - Benefits of new GCI functionalities, esp. related to data exchange
  - Improved data and products access through GEOSS
  - Benefit of EO data

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Thank You!

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