Ensemble applications TIGGE archive and the multi-disciplinary GEOWOW project

David Richardson

Head, Meteorological Operations Section,

European Centre for Medium-Range Weather Forecasts

(ECMWF)

david.richardson@ecmwf.int

ECMWF

The THORPEX Interactive Grand Global Ensemble (TIGGE)

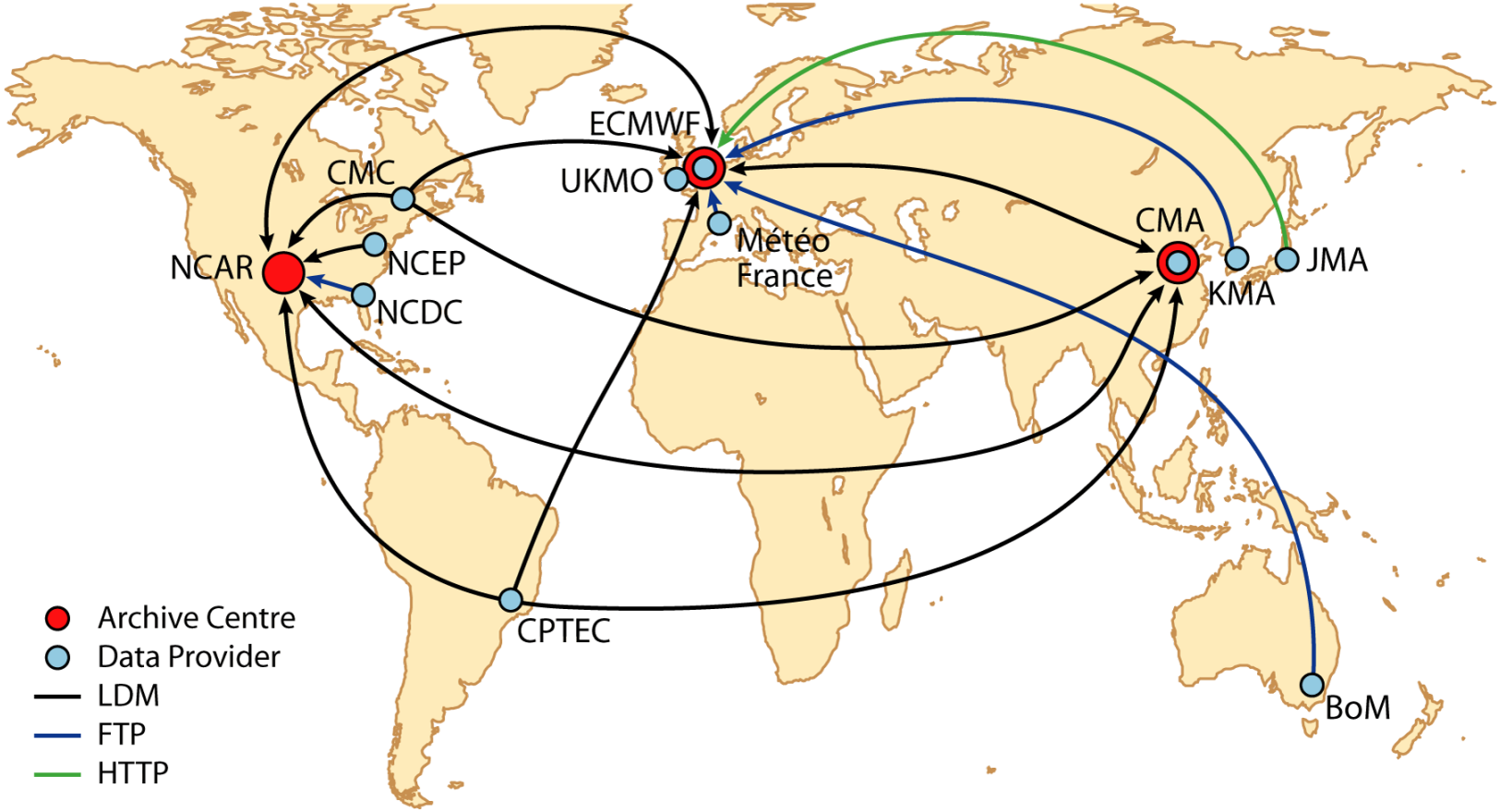
THORPEX
A World Weather Research Programme

TIGGE Objectives:

- **Enhance collaboration on ensemble prediction, both internationally and between operational centres & universities.**
- **Facilitate research on ensemble prediction methods, especially methods to combine ensembles and to correct systematic errors**
- **Enable evolution towards a prototype operational system, the "Global Interactive Forecast System"**

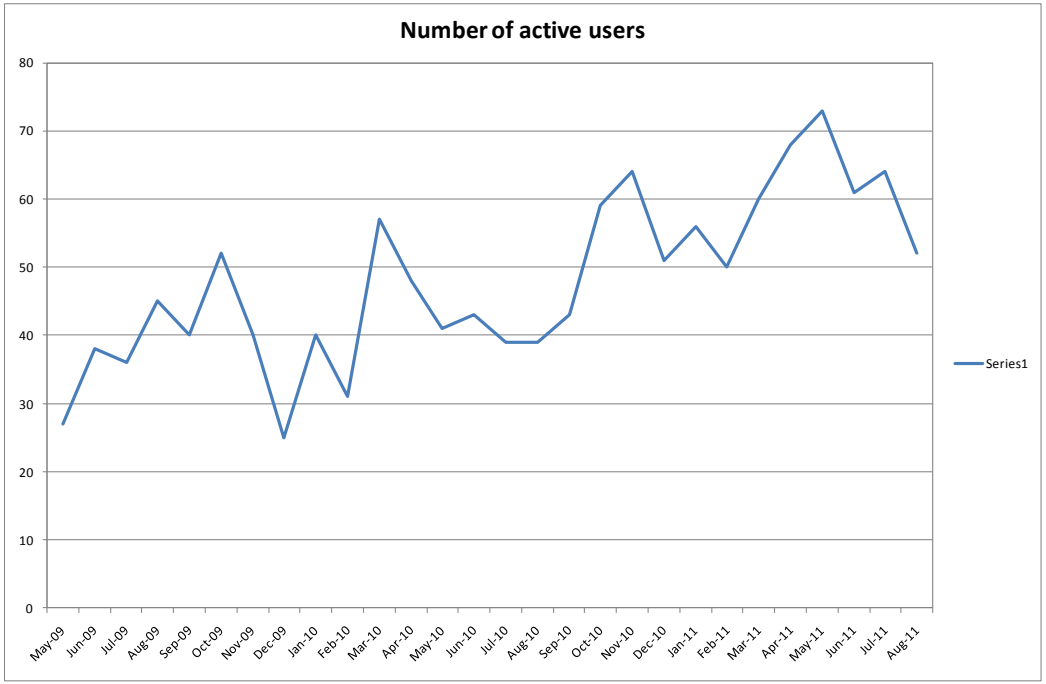
Since October 2006, the TIGGE archive has been accumulating regular ensemble weather forecasts from leading global Numerical Weather Prediction (NWP) centres.

TIGGE data flows
(6 to 30h after real time)



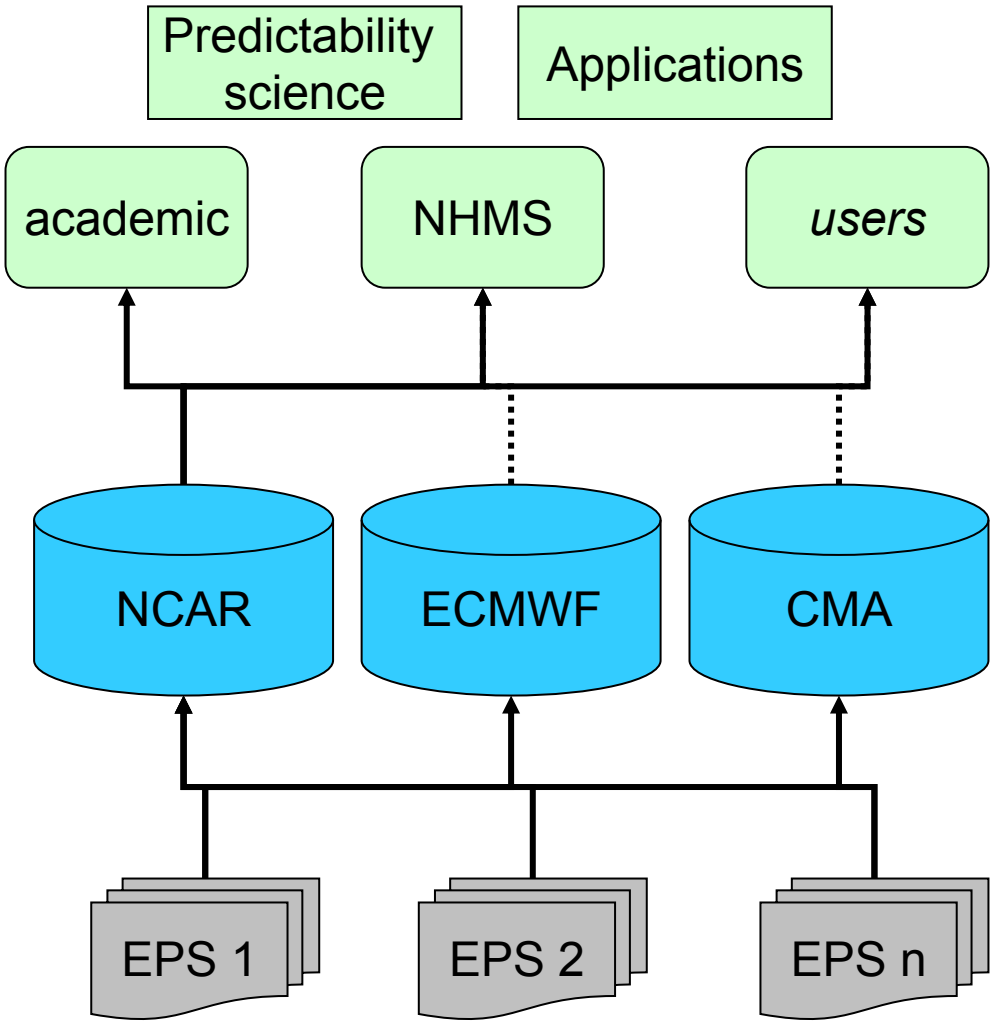
ECMWF TIGGE archive

- The TIGGE database now contains five years of global EPS data
- Holds more than 520 terabytes (2.6 billion fields).
- There are around 1300 registered users of the TIGGE data portal

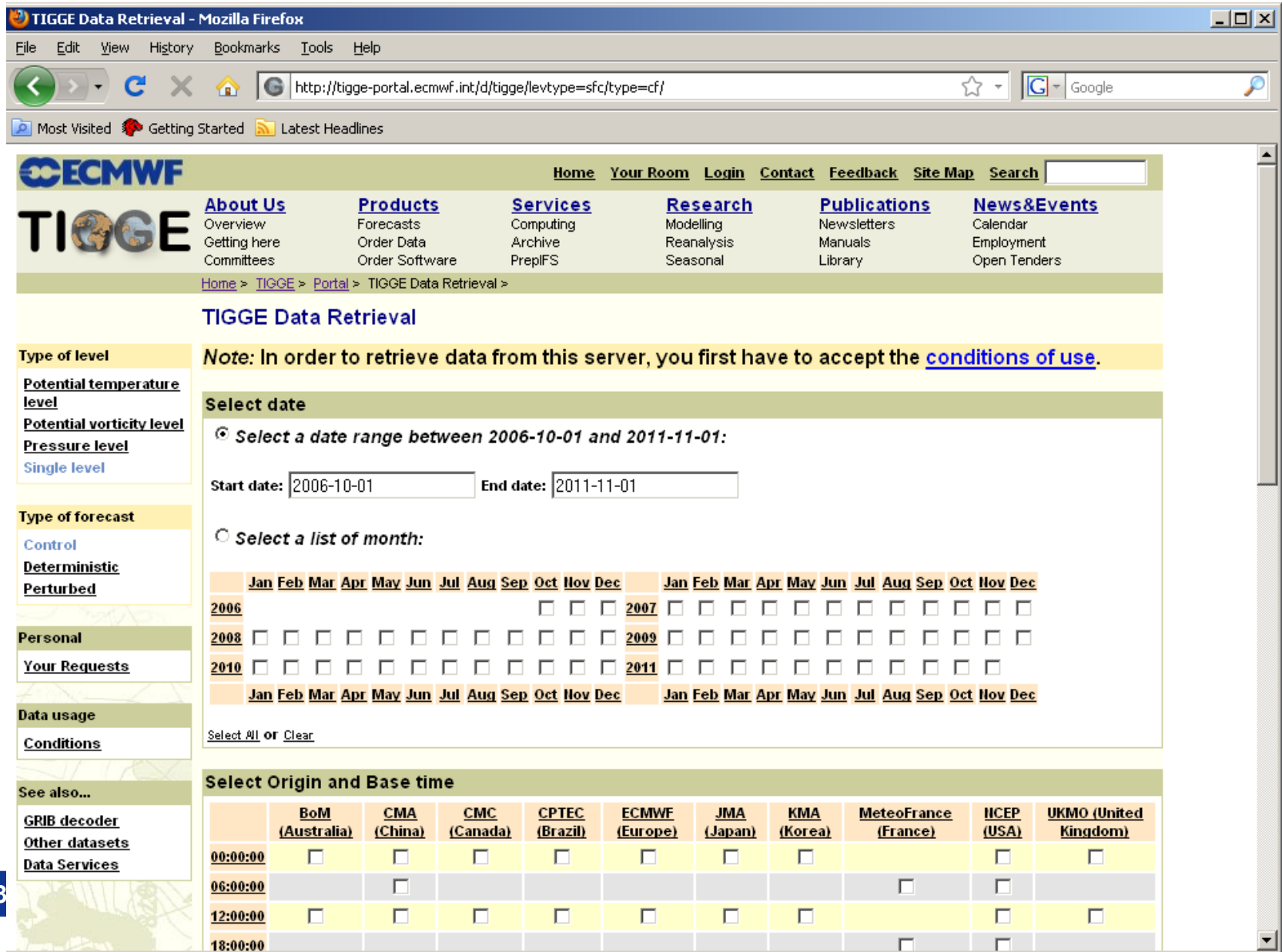


TIGGE features

- All data are archived at native resolution (on native grid when possible)
- Data are interpolated on any limited-area lat-lon grid defined by the user just before download
- Field names, definitions, units, accumulation times, etc… are fully standardized
- Data gaps are continuously monitored and every effort is made to repair them quickly
- All data provided in GRIB2



ECMWF TIGGE data portal



Research using TIGGE data

- Over 40 research papers using TIGGE data
- Calibration of EPS, combination of multi-models and research related to the development of probabilistic forecasts

- skill of MJO forecasts (Matsuedo and Endo 2011)
- regime transitions (Frame and Methven 2011)
- propagation of extra-tropical cyclones (Froude, 2010)
- comparison of TC track forecasts (Hamill 2011)

- evolution of perturbation structure (Kipling et. al., 2011)

TIGGE leaflet

WMO

THORPEX
A World Weather Research Programme

WWRP

WWRP-THORPEX

TIGGE

The THORPEX Interactive Grand Global Ensemble (TIGGE) provides a data base of ensemble predictions from the leading global NWP centres, for scientific research on predictability and development of probabilistic weather forecasting methods

http://tigge.ecmwf.int

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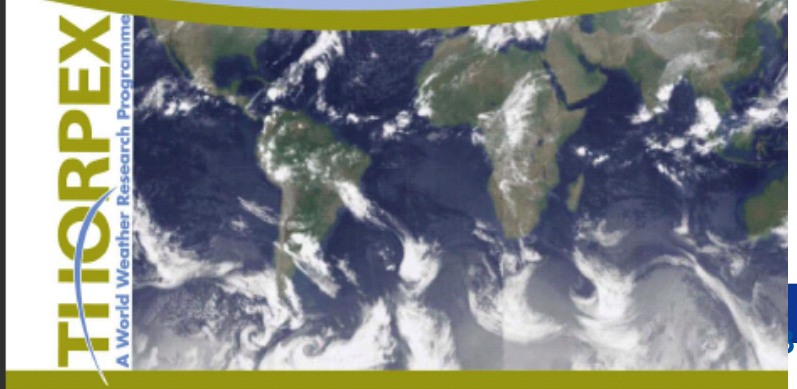
EX Interactive Grand Global Ensemble



THORPEX
A World Weather Research Programme

THORPEX

THORPEX is an international research programme to accelerate improvements in the accuracy and utility of high-impact weather forecasts up to two weeks ahead.

THORPEX – THe Observing system Research and Predictability EXperiment – was established in 2003 by the Fourteenth World Meteorological Congress. THORPEX is part of the World Weather Research Programme, under the auspices of the WMO Commission for Atmospheric Sciences (CAS), and is a key research component of the WMO Natural Disaster Reduction and Mitigation Programme.

Forecasting high-impact weather

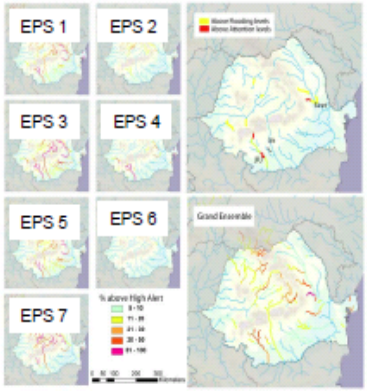
The current success of numerical weather prediction represents one of the most significant scientific achievements of the 20th century. Despite the notable increase in forecast skill over recent decades there is room for further improvement, both in the accuracy of forecasts of high-impact weather and the use of weather forecast information for socio-economic risk reduction.

Many weather forecast situations may be characterised as low probability/high risk – the event may be unlikely but the consequences may be catastrophic in terms of loss of life, property damage, loss of revenue etc. Probabilistic forecasting is a powerful tool to improve early warning of such high-impact events.

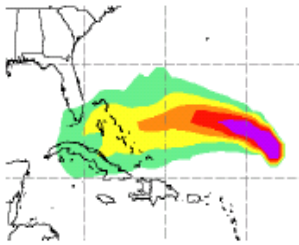
TIGGE objectives

TIGGE is a major element of the THORPEX research programme:

- Enhancing collaboration on ensemble prediction, internationally and between operational centres and universities.
- Supporting research on weather forecasting, especially applications of ensemble forecasting.
- Enabling new probabilistic forecast products for a future Global Interactive Forecast System (GIFS).



Predicting flood alerts for Romania using TIGGE



Forecasting strike probabilities for Hurricane Ike by combining two TIGGE ensembles

IWF

- ***"Understanding the Earth system — its weather, climate, oceans, atmosphere, water, land, geodynamics, natural resources, ecosystems, and natural and human-induced hazards — is crucial to enhancing human health, safety and welfare, alleviating human suffering including poverty, protecting the global environment, reducing disaster losses, and achieving sustainable development. Observations of the Earth system constitute critical input for advancing this understanding."***

- The group on Earth Observations (GEO) initiated the Global Earth Observation System of Systems (GEOSS)
- GEOWOW, short for "GEOSS interoperability for Weather, Ocean and Water" supports this objective
- GEOWOW's main challenge is to improve Earth observation data discovery, accessibility and exploitability, and to evolve GEOSS in terms of interoperability, standardization and functionality
- GEOWOW is an EU-funded FP7 project that began in September 2011

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http://www.geowow.eu/index.html

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GEOWOW

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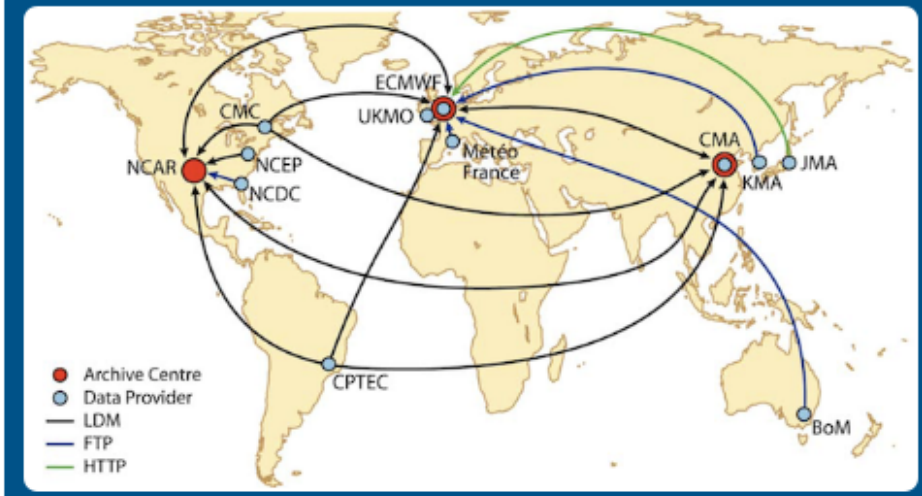
upcoming events

GEO VIII Plenary meeting

The Scientific and Technological Research Council of Turkey (TÜBİTAK) will be the host of the GEO-VIII Plenary meeting to be held in Istanbul on 16-17 November 2011.

GEOWOW Technical Meeting

JRC will be the host for the first technical meeting of GEOWOW project to be held in ISPRA on 20-21 October 2011



Related to the Weather Societal Benefit Area (SBA), the THORPEX Interactive Grand Global Ensemble (TIGGE) is an archive of global ensemble weather forecasts that are generated routinely at major weather forecast centres around the world. With GEOWOW system, users will be able to query, discover and access this enormous volume of data in an

GEO-VIII Plenary meeting

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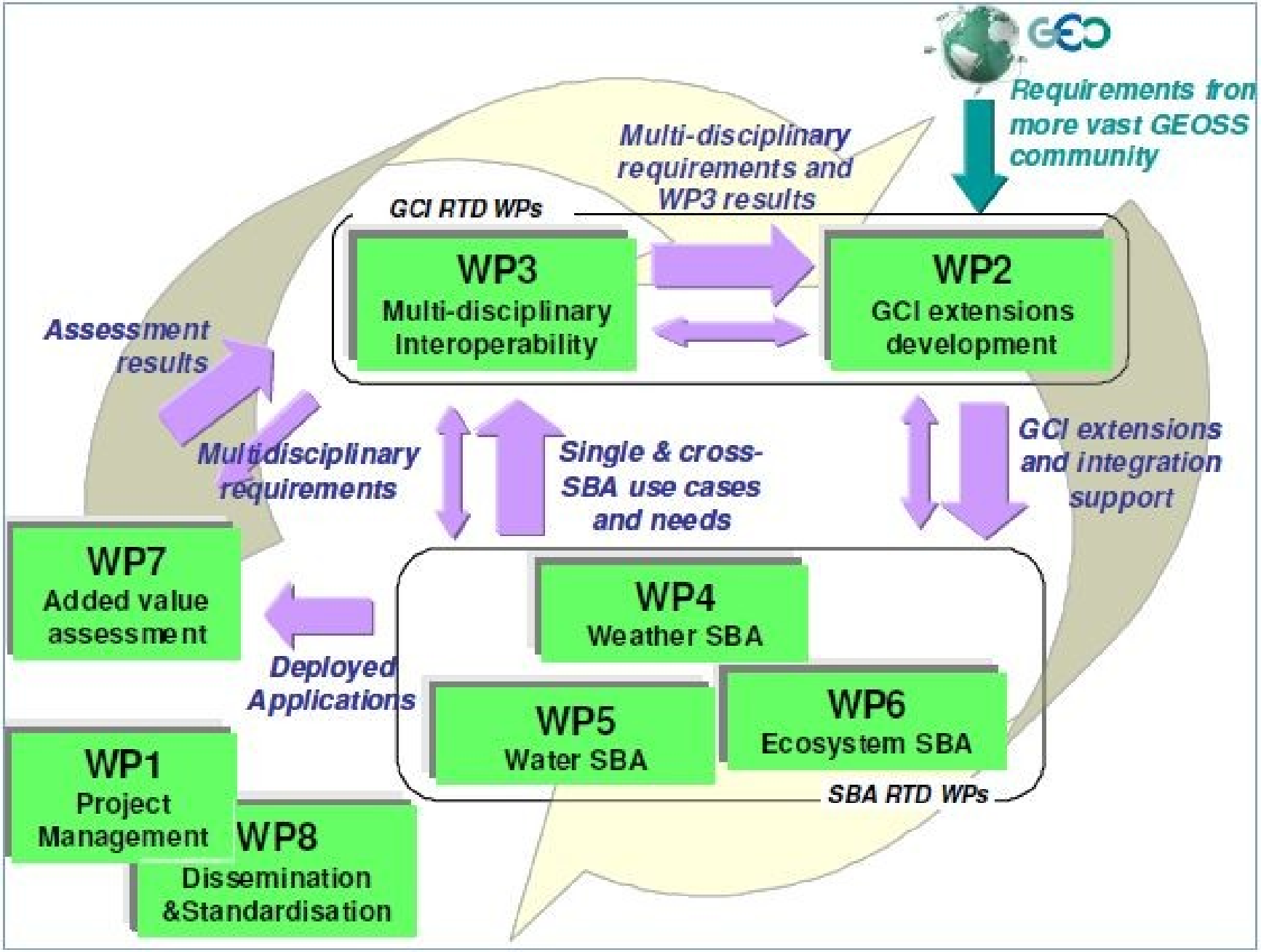
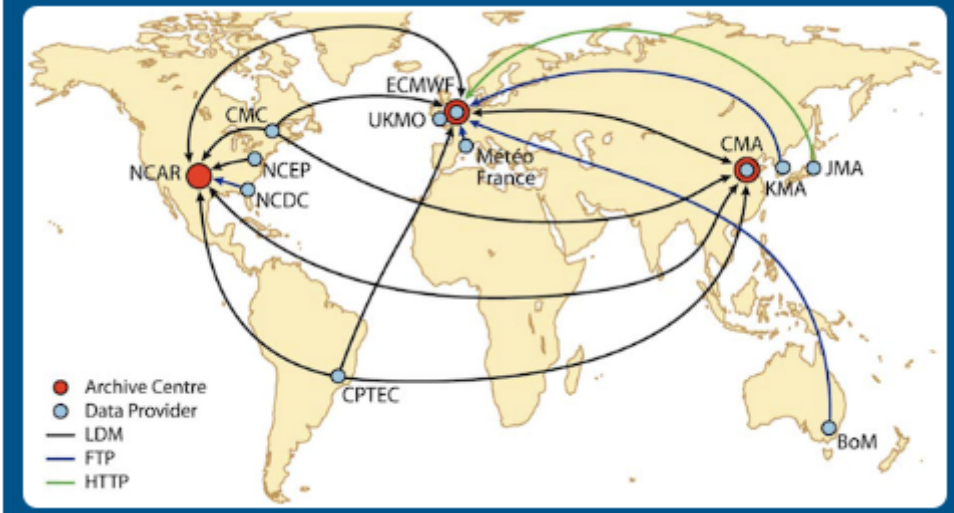

Requirements from more vast GEOSS community
Multi-disciplinary requirements and WP3 results
GCI RTD WPs
WP3
Multi-disciplinary Interoperability
WP2
GCI extensions development
Assessment results
Multidisciplinary requirements
Single & cross-SBA use cases and needs
GCI extensions and integration support
WP7
Added value assessment
Deployed Applications
WP4
Weather SBA
WP5
Water SBA
WP6
Ecosystem SBA
SBA RTD WPs
WP1
Project Management
WP8
Dissemination &Standardisation



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The EcoSystems (Oceans) Societal Benefit Area deals with a very fragile environment such as the oceans. Likewise other SBAs, there is great need for simplified data infrastructures that enable fast discovery and access of related datasets.

Within the Water Societal Benefit Area, a very heterogeneous landscape of data sources exists. Water related (sensor) data are served through a large variety of interfaces and data formats ranging from CSV files to proprietary web service interfaces based on organisational specific XML formats.

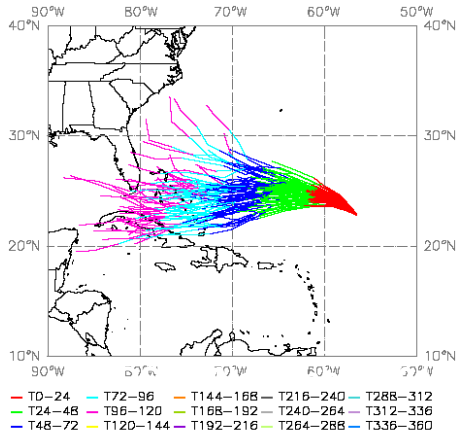
ECMWF

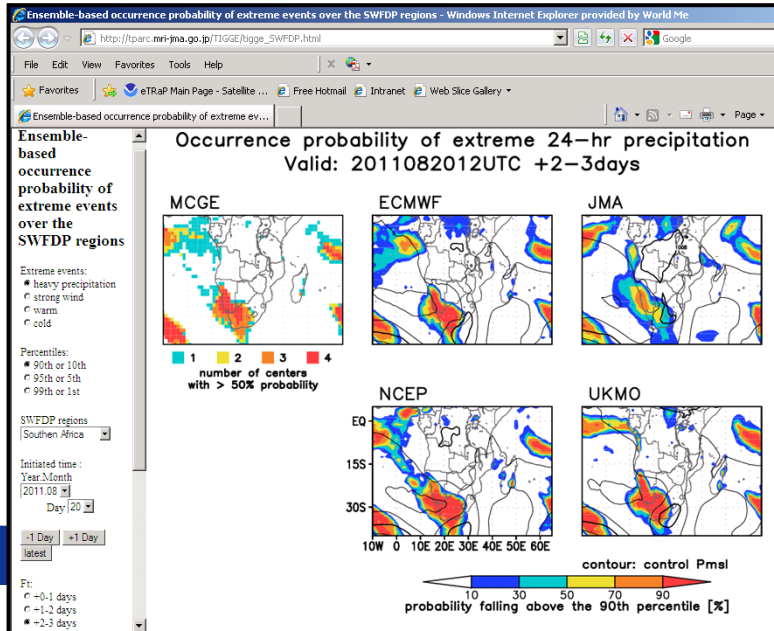
GEOWOW

- TIGGE data in GEO Common Infrastructure (GCI)
- Significantly enhance the accessibility of the TIGGE archive at ECMWF for the wider user community
  - ability to efficiently access long time series of forecast data at user-specified locations
  - netCDF
- European LAM EPS in TIGGE archive

GEOWOW

- TIGGE data quality (bias, calibration, combination)
- Develop and demonstrate EPS-based forecast products for high-impact weather events
  - Tropical cyclones, heavy rainfall, extra-tropical cyclones
  - WMO Severe Weather Forecast Demonstration Project
  - where feasible multidisciplinary use across different GEO Societal Benefit Areas
  - education and training





Summary

- **Since October 2006, the TIGGE archive has been accumulating regular ensemble forecasts from leading global NWP centres.**
- **TIGGE provides the basis for research and development projects targeted at specific applications of severe weather forecasts (health, energy, flood warning, wind storms, fire weather, etc…).**

TIGGE website: http://tigge.ecmwf.int

- **GEOWOW will improve access to TIGGE data to wider user community**
- **GEOWOW will develop EPS based products for early warnings of severe weather; collaboration with WMO SWFDP**

GEOWOW website: http://www.geowow.eu