TIGGE-LAM

European LAM EPS

archiving at ECMWF

Richard Mladek (ECMWF)

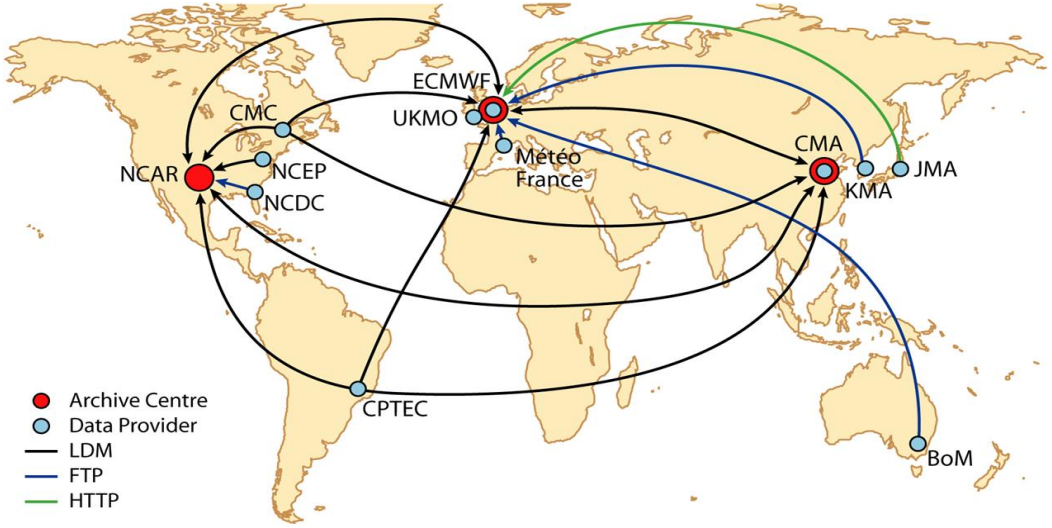
Tiziana Paccagnella (ARPA-ER SIMC)

TIGGE

The WWRP/THORPEX/TIGGE project has developed a database of global ensemble forecasts collected in near real-time.

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



TIGGE LAM archiving: short summary

After the set-up of the TIGGE LAM Panel, one of the first action planned was the contribution of LAM EPS to the TIGGE archive.

4th of October 2007,Tigge-LAM meeting,San Lorenzo de El Escorial, Spain.

- We defined a list of parameters to be archived
- High Priority parameters were shortlisted
- We agreed to adopt GRIB2 coding as prescribed by TIGGE
- We decided to ask TIGGE LAM/LAM EPS providers to interpolate their products on a regular lat/lon grid at 0.1° horizontal resolution (which is not the case anymore!!!!).

This homogenization of the datasets was decided to facilitate the use of our products by scientists and users outside the meteorological modeling community. Hydrologists in primis.

ECMWF did not have at that time the SW utilities to allow the management and post-elaboration of LAM products on different rotated or projected grids.

TIGGE LAM archiving: short summary

It was decided to ask the three TIGGE archiving Centres to host the TIGGE LAM archives.

They accepted.

ECMWF was asked to archive European systems and few others (e.g. south Africa ..)

NCAR to archive Americas and Canada

CMA to archive Asian products.

Other systems were not on the list at that time and each specific new entry should have been considered when necessary.

Even if some preliminary work was started, everything was dumped due to lack of devoted resources.

TIGGE LAM archiving: short summary

More recently, during the writing of the TIGGE LAM Plan, it was decided to remove the option of interpolating on a common grid. It was proposed to keep the full model resolution and preserve the original information. Anyway it was just theory since no resources were available.

Due to the recent increase of resolution of LAM EPS, archiving at the original resolution on native grids is now suggested.

Ongoing related activities

Asia: CMA regional LAM EPS is now archived at CMA.

Europe: HP parameter archiving activities at ECMWF are planned to start at the end of 2011 thanks to resources available in the framework of the GEOWOW project. The SW required to retrieve and manage the LAM EPS products will be also developed. GEOWOW (GEOSS interoperability for Weather, Ocean and Water) is an EU-funded FP7 project started in September 2011.

North America: feasibility is currently ongoing.

6.4 Action 4: Definition and adoption of the TIGGE LAM data policy

TIGGE LAM data providers should agree about data access policy following what has

TIGGE-LAM archive

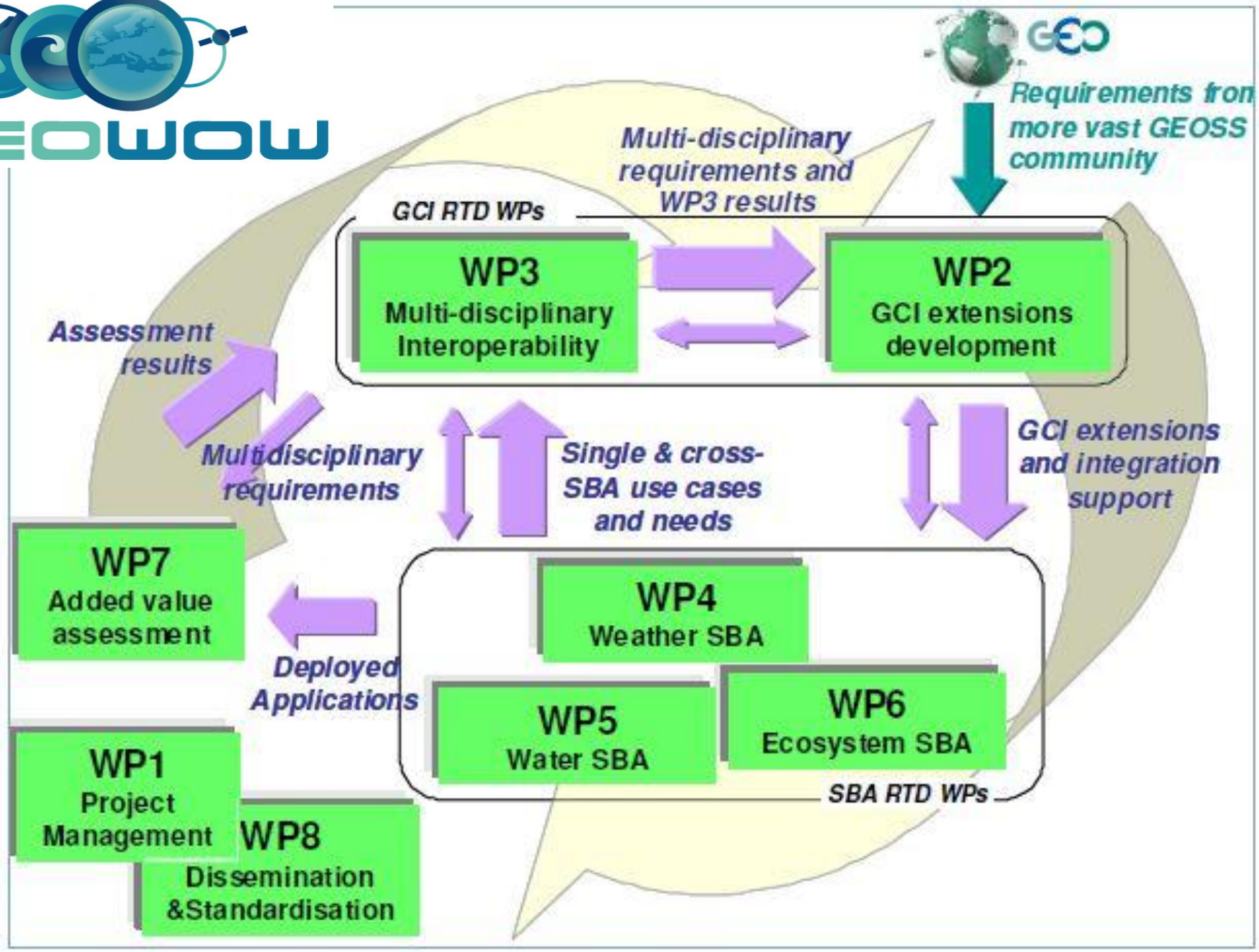
- The idea of the TIGGE LAM archive only recently came to life in the frame of **GEOWOW project** (more specifically its Work Package 4 led by ECMWF).
- **ECMWF assignee for GEOWOW**

  Accountable: Florian Pappenberger

  Participants on TIGGE-LAM archive:

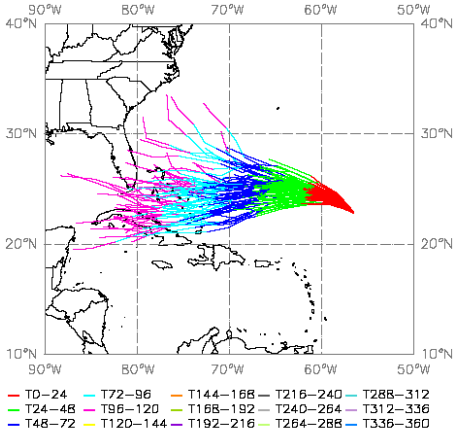
  - Baudouin Raoult (technical lead)
  - Richard Mladek (archive development)
  - Manuel Fuentes (MARS related development)
  - Shahram Najm (GRIB-API related modifications)

- 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


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
WP4
Weather SBA
Deployed Applications
WP5
Water SBA
WP6
Ecosystem SBA
SBA RTD WPs
WP1
Project Management
WP8
Dissemination &Standardisation

WP4 (weather SBA)

1. **Enhancement of the TIGGE archive** at ECMWF (register data in GCI; adding LAM-EPS outputs; creating time-series archive)
2. **TIGGE data quality** (bias, calibration, combination)
3. **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



TIGGE-LAM archive

- **Extension of TIGGE (global) archive** with limited area ensemble forecasts
- **10 data providers confirmed** (MOGREPS , COSMO-LEPS, ALADIN-LAEF, DMI–HIRLAM, GLAMEPS, COSMO-DE-EPS, PEARP, AEMET-SREPS, SRNWP-PEPS, HUNEPS)
- **Archive specification:**
  - Data format: WMO-GRIB2
  - Time step frequency: 3h
  - Grid: original model grid
  - Parameters: mostly so called High Priority surface parameters
  - Model runs: all available (00, 06, 12, 18UTC)
  - Forecast types: perturbed and control (if available)

TIGGE-LAM archive

List of archived parameters

- Instant fields

10m U-velocity, 10m V-velocity, CAPE (not HP), CIN (not HP), MSLP, 2mT, 2m dewpointT

- Accumulated fields

total and large scale precipitation, 10 metre wind gust (in the last 3 hours)

- Static fields

Orography, LSM

Model	Organisation	Approval status	Technical/scientific contact	Coordination contact
MOGREPS	UK Met Office / UK	confirmed	Warren Tenant Thomas Green	Richard Schwinbank
COSMO-LEPS	ARPA-SIM / Italy	confirmed	Andrea Montani	Tiziana Paccagnella
ALADIN LAEF	ZAMG / Austria	confirmed	Florian Weidle	Yong Wang
DMI - HIRLAM	DMI / Denmark	confirmed	Henrik Feddersen	Xiaohua Yang
GLAMEPS	DNMI /Univ Oslo + HIRLAM + ALADIN	confirmed	Inger-Lise Frogner	Xiaohua Yang
COSMO-DE-EPS	DWD / Germany	confirmed	Andreas Roepnack	Christoph Gebhardt
PEARP	Meteo-France / France	confirmed	Philippe Arbogast	
COSMO-SREPS	ARPA-SIM / Italy	currently out of scope	Chiara Marsigli	Tiziana Paccagnella
SREPS	AEMET / Spain + HIRLAM	confirmed	Carlos Santos Burguete	José García-Moya
SRNWP PEPS	DWD / Germany	confirmed	Sebastian Trepte	Michael Buchhold
HUNEPS	OMSZ / Hungary	confirmed	Mile Máté	

- **Processing and archiving** of LAM data follow the way the TIGGE global archive works
- **Used technologies**
  - Shell / C / python code for data processing and verification
  - SMS(Supervisor Monitor Scheduler) for running of TIGGE-LAM (quasi)operational suite
  - MARS(Meteorological Archive and Retrieval System) for data storage
  - Web or MARS batch interface for data access

Main new developments

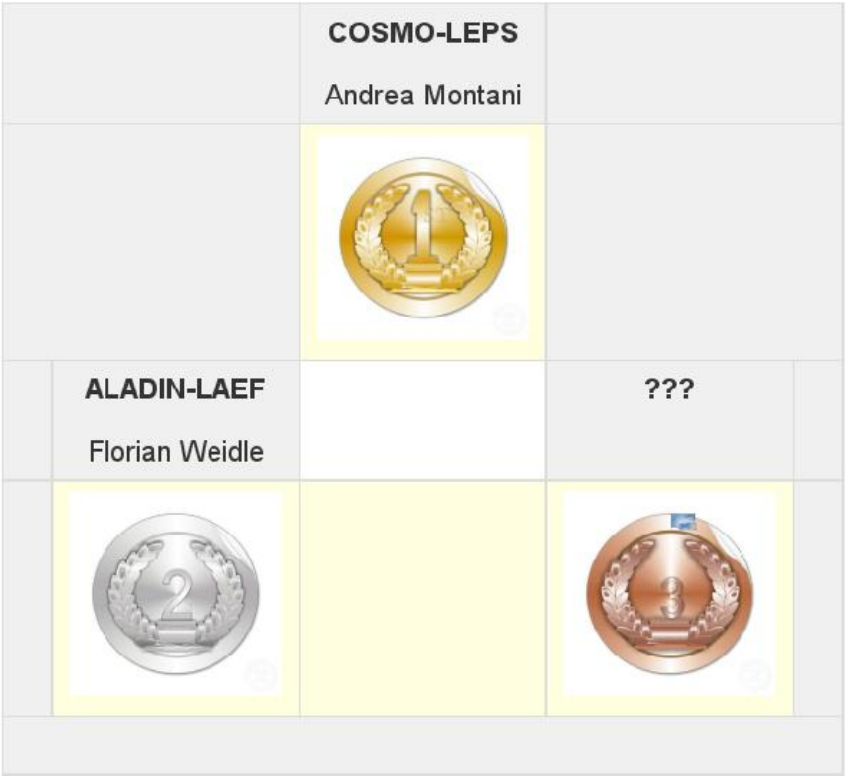
- New conversion tool (using python GRIB-API) used for input LAM-EPS data conversion from GRIB1 to GRIB2
- Update of the GRIB_API tool (development version 11.1.0) to be able to produce GRIB files in TIGGE compliant format (continuity with TIGGE global data format)
- **Upgrade of monitoring and data checking tools to avoid data loses and to keep datasets as homogeneous as possible**
- **Upgrade of user web interfaces allowing well arranged overview of available products and their quick and reliable retrieval**

TIGGE-LAM archive

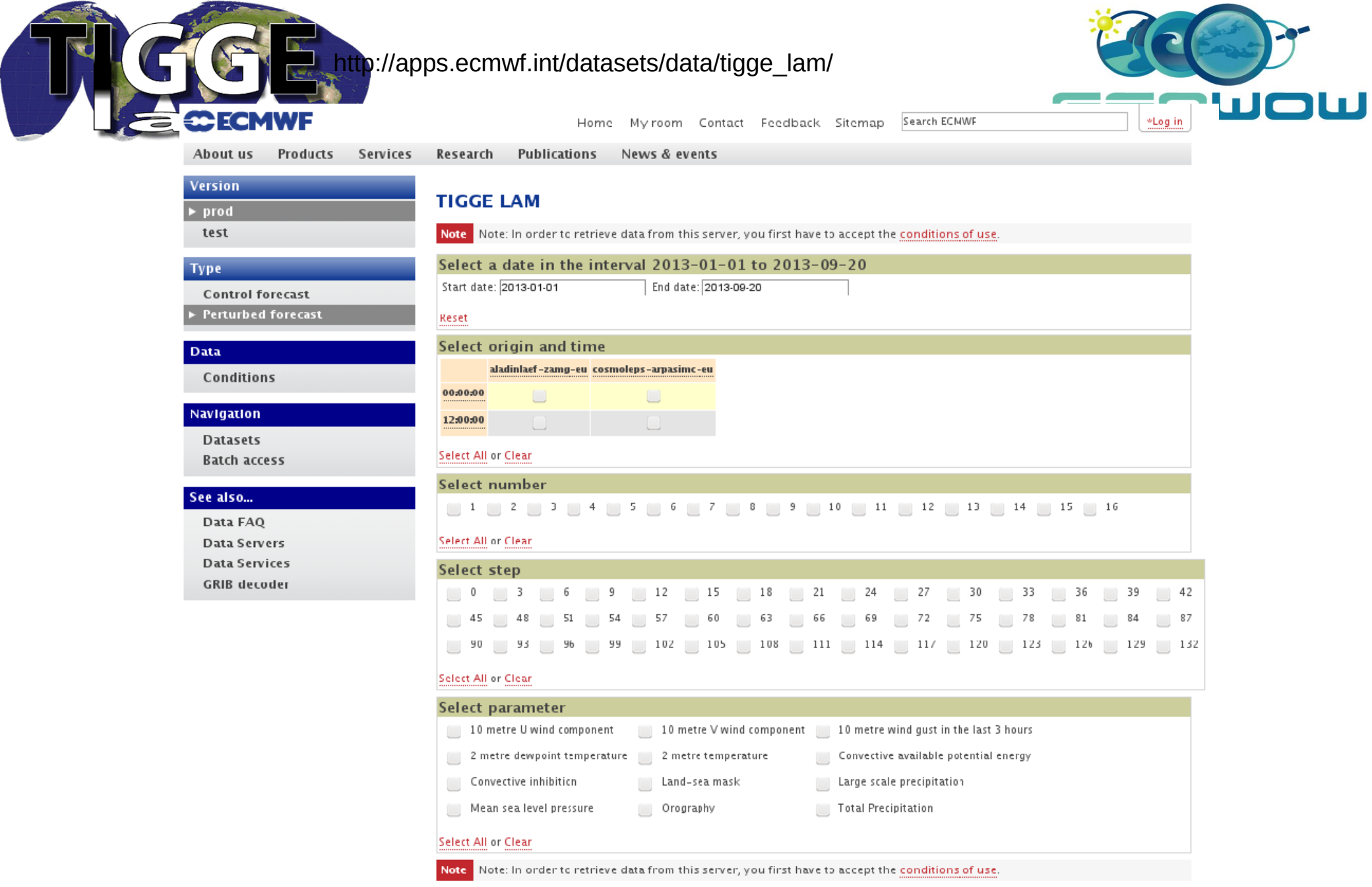
- 1st operationally stored dataset in production mode is COSMO-LEPS (from 01.01.2013)
- 2nd ALADIN-LAEF
- 3rd ? (tough fight)

  (COSMO-DE-EPS, HUNEPS,

  GLAMEPS, PEPS...)



http://apps.ecmwf.int/datasets/data/tigge_lam/

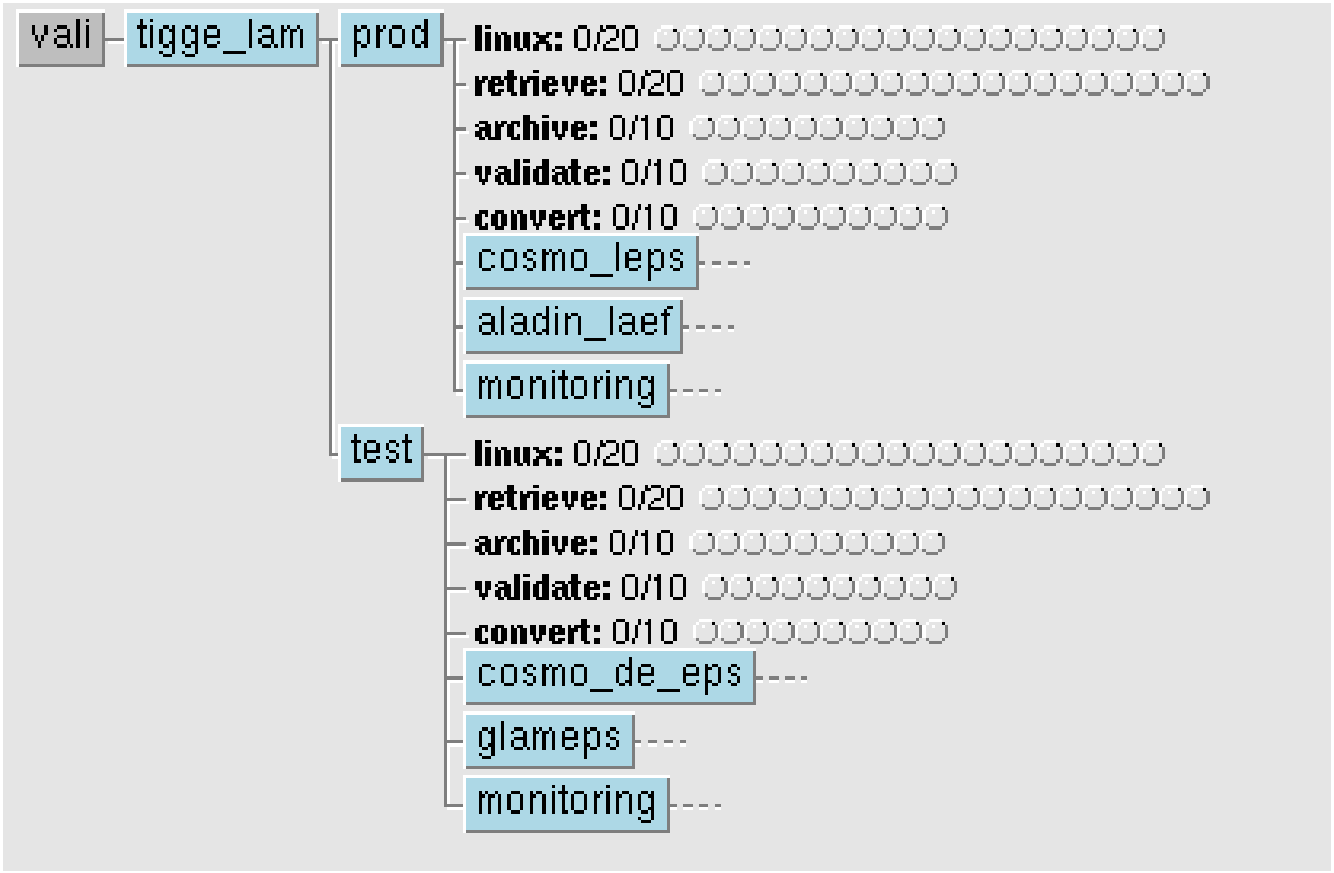


Data provider progress status information

Model	Data status	Next milestone	When
MOGREPS	Data checking & tuning.	Complete development phase.	Sep-2013
COSMO-LEPS	Fully operational archiving.	Go for a wine..	
ALADIN-LAEF	Fully operational archiving.	Go for a beer..	
DMI-HIRLAM	Development phase finished.	Start test phase.	Sep-2013
GLAMEPS	Data checking & tuning.	Complete development phase.	Oct-2013
COSMO-DE-EPS	Regular archiving in test mode.	Complete test phase.	Sep-2013
PEARP	Receive the first data sample.	Start development phase.	**ASAP**
COSMO-SREPS	Discontinued.	Use COSMO-HYBEPS instead.	TBD
AEMET-SREPS	Receive the first data sample.	Start development phase.	**ASAP**
SRNWP-PEPS	Data checking & tuning.	Complete development phase.	Oct-2013
HUNEPS	Development phase finished.	Start test phase.	Sep-2013

Operational TIGGE-LAM suite

(run at ECMWF as the 1st operational suite under ECFLOW – successor of SMS)



http://tigge.ecmwf.int/tigge/d/inspect/tigge/tigge/monitoring/lam/prod

ECMWF Home | Your Room | Login | Contact | Feedback | Site Map | Search:

TIGGE

About Us: Overview, Getting here, Committees
Products: Forecasts, Order Data, Order Software
Services: Computing, Archive, PrepIFS
Research: Modelling, Reanalysis, Seasonal
Publications: Newsletters, Manuals, Library
News&Events: Calendar, Employment, Open Tenders

ECMWF graphical product catalogue > TIGGE > Monitoring > LAM > PROD > Perturbed forecast>

Perturbed forecast

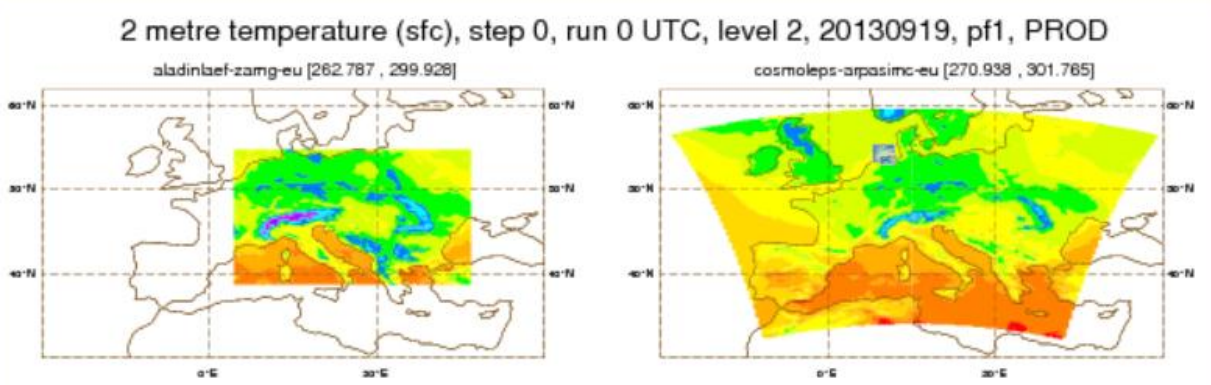
Forecast type
Perturbed forecast
Control forecast

Parameter | **Step (-> valid time)**
2 Metre Temperature | 0 (Thu 19 Sep 2013 12UTC)

Run
0
12

Show overview
Parameter
Step (-> valid time)
Run

Download...
PDF (299.2 Kbytes)
Postscript (603.9 Kbytes)



TIGGE-LAM archive

http://tigge.ecmwf.int/tigge/d/tigge_lam_history

	aladinlaef-zamg-eu 00Z	aladinlaef-zamg-eu 12Z	cosmoleps-arpasimc-eu 00Z	cosmoleps-arpasimc-eu 12Z
2013-01-01			starting 7184 fields	starting 7184 fields
2013-06-03	starting 3521 fields	starting 3521 fields		
2013-06-26	1054 missing fields	1054 missing fields		
2013-06-27	1054 missing fields	1054 missing fields		
2013-06-28	1054 missing fields	1054 missing fields		
2013-06-29	1054 missing fields	1054 missing fields		
2013-06-30	1054 missing fields	1054 missing fields		
2013-07-01	1054 missing fields	1054 missing fields		
2013-07-02	1054 missing fields	1054 missing fields		
2013-07-03	1054 missing fields	1054 missing fields		
2013-07-04	1054 missing fields	1054 missing fields		
2013-07-05	1054 missing fields	1054 missing fields		
2013-07-09		680 new fields		
2013-07-10	680 new fields			
2013-09-20				

TIGGE-LAM archive

Challenges

- To archive multi-model ensembles like GLAMEPS or especially PEPS (missing parameters for some models; varying forecast lengths; different model domains; varying EPS size for different run times etc.)
- To achieve homogeneity in TIGGE-LAM archive without major or often repeated gaps (impossibility to re-process all EPS forecasts from the past for some systems = major difference to TIGGE global datasets).

TIGGE-LAM T-S archive

Building a multi-model EPS time-series dataset (Global and LAM)

- The aim is significantly increase the accessibility of the TIGGE and TIGGE-LAM archives for a wider community
- Currently it's impossible to perform research on long time-series without retrieving all the original fields
- Only selection of points (SYNOP, METAR, etc.) and TIGGE parameters will be archived
- All global TIGGE data will be back-archived since 2006 as well

TIGGE-LAM T-S archive

Important decisions before building the T-S archive (still open for discussion)

- **Location list:** GTS synop locations (for global data) + selected special points of interest (mainly for HR LAM-EPS datasets)
- **Method for getting model forecast for given location:** current proposal is to archive halo of 4 surrounding nearest model grid point values sorted according to their distance to the point location + some additional information (land-sea mask, orography, distance from the point location)
- **Parameter list:** current proposal is to archive basically all surface parameters as in TIGGE-LAM i.e. mostly so called High Priority parameters
- **Data archival format** - NetCDF format is currently being tested and is the most probable candidate

TIGGE LAM archive: next further steps?

- **ECMWF TIGGE LAM archive**

As regards Europe, ECMWF confirmed its willingness to continue TIGGE archiving also after THORPEX; this will include TIGGE LAM Europe.

To allow a further development of the system, after GEOWOW, it is necessary to provide specialized resources to ECMWF (FTEs could be founded by new projects or from other centres and research institutes).

– new parameters following the new WMO HIW (High Impact Weather) project requirements and possible extension to upper level parameters
– new post processing, product combination and visualization
– …….

- **TIGGE LAM archives outside Europe?**

Is it possible to re-evaluate the implementation of the TIGGE LAM archives in other Regions outside Europe?

TIGGE LAM archive: next further steps?

- **Archiving FDPs RDPS and other Project datasets.**

  A big support to research efforts could also be given by including in the archives not only the operational datasets, but also the Project datasets like those developed and provided during RDPs and FDPs.

  The increase in horizontal resolution brings to a reduction of the model domain > smaller overlapping of the integration domains

  These projects offer a unique opportunity to support research and an easy access to numerical products in an homogeneous way would represent a breakthrough. Usually these datasets are used for a limited period and by the scientific community directly involved in the projects. In this way the value of these big projects would last for a longer time and a wider community could be involved.

Summary and concluding remarks

- 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…).
- GEOWOW will extend TIGGE archive with limited area ensemble forecasts
- GEOWOW will improve access to TIGGE data to wider user community (registration in GCI; T-S archive)
- GEOWOW will develop EPS based products for early warnings of severe weather; collaboration with WMO SWFDP

Summary and concluding remarks

- TIGGE LAM archiving at ECMWF will be continued after THORPEX and GEOWOW as a support to HIW project after THORPEX.

  Devoted resources would allow further developments

- The possibility to have more than one TIGGE LAM archiving centre depends on the decisions of NCAR and CMA.

- Could TIGGE LAM archives be extended to include datasets from the major cooperation projects endersed by WMO?

Links

Information

- http://www.geowow.eu
- http://tigge.ecmwf.int
- https://software.ecmwf.int/wiki/display/TIGGE/TIGGE-LAM
- https://software.ecmwf.int/wiki/display/TIGGE/TIGGE+EPS+time-series+archive

Geo portal (GCI interface)

- http://www.geoportal.org/web/guest/geo_home

TIGGE-LAM Data portal

- http://apps.ecmwf.int/datasets/data/tigge_lam/

Thank you!