

# *Integration of TIGGE/S2S data archive into GDPFS*

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**WMO OMM**

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# Contents

- Brief Introduction of TIGGE data archive
- Brief Introduction of S2S data archive
- Integration of TIGGE/S2S data archive into GDPFS

# TIGGE: The International Grand-Global Ensemble



- The TIGGE dataset consists of ensemble forecast data from thirteen global NWP centres, starting from October 2006
- TIGGE was established as a key component of THORPEX: a World Weather Research Programme to accelerate the improvements in the accuracy of 1-day to 2 week high-impact weather forecasts for the benefit of humanity
- Although the decade-long THORPEX programme had finished at the end of 2014, TIGGE continued for a further 5 years
- Currently another stage of TIGGE archive has already been confirmed for further 4 years until the end of 2023



# TIGGE: The International Grand-Global Ensemble

- TIGGE data is available free of charge for scientific research, via data archive portals at ECMWF and CMA.
- TIGGE has become a focal point for a range of research projects, including research on ensemble forecasting, predictability and the development of products to improve the prediction of severe weather.
- **ECMWF** portal: <http://apps.ecmwf.int/datasets/data/tigge>
- **CMA** (China Meteorological Administration) portal: <http://wisportal.cma.gov.cn/wis>
- **NCAR** portal: [NCAR CXML TIGGE TC archive](#)



# TIGGE archive evolution

- Phase I: TIGGE-GIFS WG - 2006 until 2014
  - 3 Archive Centres, CMA, NCAR, ECMWF
  - BoM ceased in 2010
  - Extended TIGGE to Limited Area Models (TIGGE-LAM) from Jan 2013
- Phase II: PDEF WG - 2014 to 2019
  - At the end of THORPEX, got commitment to continue for additional 5 years
  - 2 Archive Centres for gridded data: CMA, ECMWF
  - 1 Archive Centre for Tropical Cyclones in CXML: NCAR
  - NCMRWF (India) added in 2017
  - Discontinued TIGGE-LAM in 2019 (due to lack of users)
- Phase III: PDEF WG - 2019-2023
  - All Data Providers committed to continue ([Letter requesting extension until 2023](#))
  - ECMWF, CMA happy to continue with TIGGE Database, NCAR with TC tracks archive
  - IMD and DWD added in 2020, BoM resumed in 2020



# TIGGE models

	Status on 2021-04-27	Time range [Days/Hours]	Resolution (original) [km]	Resolution (archived) [°]	Ens. Size	High-res.?	Runs [UTC]	Daily data volume (all runs) [GB]
1	BoM (ammc)	d 0-10		0,45 x 0.3	17		0/6/12/18	23.5
2	CMA (babj)	d 0-15	50	0.5 x 0.5 (as original)	30		0/12	83
3	CPTEC (sbsj)	d 0-15	104	0.9375 x 0.9375	15		0/12	7
4	DWD (edzw)	h 0-180	40	0.5 x 0.5	40	yes	0/12	78
5	<a href="#">ECCC</a> (cwao)	d 0-16	39	0.25 x 0.25	21	yes	0/12	153
6	<a href="#">ECMWF</a> (ecmf)	d 0-15	16/32	<a href="#">O640</a> (ORGG)	51	yes	0/12	1100
7	IMD (vabb)	d 0-10	12	0.12 x 0.12	21	cf	0/12	467
8	<a href="#">JMA</a> (rjtd)	d 0-11	139	1.25 x 1.25 (as original)	51		0/12	15
9	KMA (rksl)	d 0-12	33	0.3 x 0.45 (as original)	25	yes	0/12	41
10	<a href="#">Meteo-France</a> (lfpw)	h 0-108	7.5-37**	0.5 x 0.5	35	cf	0/6/12/18	46
11	<a href="#">NCEP</a> (kwbc)	d 0-16	25	0.5 x 0.5	31		0/6/12/18	102
12	NCMRWF (dems)	d 0-10	13	0.18 x 0.12	12	cf	0/12	398
13	<a href="#">UKMO</a> (egrr)	h 0-174	21	0.187 x 0.28125 (as original)	18		0/6/12/18	225



# TIGGE & S2S databases: ECMWF status & usage

Contents	TIGGE	S2S
Archive size	6.1 PiB	180 TiB
Daily archive	3.4 TiB	72 GiB (average)
Number of fields	9 billion	3.5 billion
Time span	2006-present	2015-present

Activity	TIGGE (since 2014)	S2S
Nr active users	3563	1675
Delivered data	794 TiB	1.1 PiB
Retrieved fields	12,736,083,439	26,460,864,874
Nr requests	7,909,426	19,427,590
Volume data on disk	170 TiB	180 TiB



# Sub-Seasonal-to-Seasonal Prediction (S2S) Project

- A joint World Weather Research Programme (WWRP) and World Climate Research Programme (WCRP).
- The first 5-year phase of S2S Project started in 2013.
- The second 5-year phase of started in 2018.
- One of the core objective of the S2S project is to archive data from sub-seasonal forecast systems to enable research to improve understanding of S2S predictability and to develop products.





# Sub-Seasonal-to-Seasonal Prediction (S2S) Project: Objectives

- To improve forecast skill and understanding on the subseasonal to seasonal timescale with special emphasis on high-impact weather events.
- To promote the initiative's uptake by operational centres and exploitation by the applications community.
- To capitalize on the expertise of the weather and climate research communities to address issues of importance to the Global Framework for Climate Services.



# S2S Project: Models and variables

- Pressure level variables (z,u,v,T,q)
- Single level variables (T2m, precip,...)
- Ocean variables
- A total of ~80 variables on daily frequency
- Both hindcasts and real-time forecasts
- Data archived by ECMWF & CMA

- > BoM Model
- > CMA Model
- > CNRM Model
- > ECCO Model
- > ECMWF Model
- > HMCR Model
- > IAP-CAS Model
- > [ISAC-CNR Model](#)
- > JMA Model
- > KMA Model
- > NCEP Model
- > UKMO Model

12 Models



# Continuation of S2S Project database

- S2S Project is ending in 2023.
- Its operational counterpart has already been included in the Manual on the GDPFS (GPCs-SSF, LC-SSF)
- The number of variables in the operational infrastructure, however, is much smaller (and is geared towards forecast products).
- There is a desire from the research community to continue the S2S Project database to facilitate research and improve understanding (research data set is not released in real-time)



# Request from RB

- The International Grand Global Ensemble (TIGGE) and the Sub-seasonal to Seasonal Prediction Project (S2S), overseen by the Research Board (RB), are scheduled to end in 2023.
- **RB**, on behalf of the World Weather Research Programme (WWRP), **requests that the Commission for Observation, Infrastructure and Information Systems (INFCOM) consider establishing Lead centre(s) to ensure that the data bases, which are the asset of these projects, can be maintained beyond 2023**, and that the data can continue to be accessed for research and development purposes and that some, if not all, of the data can be obtained in a timely and stable manner with an appropriate data format for operations.



# Ad-hoc task team

- Joint team between SC-ESMP and RB
  - ET-OWFS
  - ET-OCPS
  - PDEF
  - S2S Steering Group
  - TIGGE Panel
  - Reps. of Data Archive Centres

Name	Organization	Representing
Joohyung Son	KMA	ET-OWFS
Arun KUMAR	NOAA	ET-OCPS
Frederic Vitart	ECMWF	S2S Steering Group co-chair
John Methven	University of Reading	PDEF co-chair
Manuel Fuentes	ECMWF	Focal point of TIGGE/S2S data archive
Richard Mladek	ECMWF	Focal point of TIGGE/S2S data archive
Dr. Junchen Yao	CMA	Focal point of S2S data archive
Dr. Xing Hu	CMA	Focal point of S2S data archive
Li Gao	CMA	Production support of TIGGE data archive
Xiaoli Li	CMA	Production support of TIGGE data archive
Jing Chen	CMA	Production support of TIGGE data archive
Yuanzhe Wang	CMA	Production support of TIGGE data archive
Yang Feifei	CMA	Focal point of TIGGE data archive
Douglas Schuster	NCAR	Focal point of TIGGE TC tracks archive
Yuki Honda	WMO	EPD
Eunha Lim	WMO	EPD
Yuheng He	WMO	EPD
Estelle De Coning	WMO	
Munehiko Yamaguchi	WMO	WWRD

# Lead Centres for Data Archive

- Lead Centre conducting coordination of Ensemble Prediction System data archive for short to medium-range forecasts (LC for EPS MRF)
  - Successor of TIGGE data archive
- Lead Centre conducting coordination of Ensemble Prediction System data archive for sub-seasonal forecasts (LC for EPS SSF)
  - Successor of S2S data archive



# Functions of LC for EPS MRF

Lead Centre shall:

- a) Select a group of modelling centres, including RSMCs for global deterministic NWP and RSMCs for global ensemble NWP (the “contributing centres”);
- b) Provide the facility for contributing centres to automatically deposit their EPS data as defined in Appendix 2.2.xx;
- c) Maintain an archive of the EPS data from individual contributing centres;
- d) Make available (on a password-protected website, as needed) agreed EPS products (Appendix 2.2.xx) in standard format with a delay of 48 hours after the forecast initial time for research and educational purposes;
- e) Monitor the received EPS data and consult with the relevant contributing centres if data are missing or suspect;
- f) Collect from the contributing centres information on any changes to their EPSs;
- g) Maintain a statistics of registered users and data downloads and summarize the statistics on a yearly basis;
- h) Provide on its website(s) :
  - Relevant documentation, including access to the EPS data and links to the websites of the contributing centres;
  - The list of the active contributing centres and the specification of their EPSs.

The centre(s) should also

- a) Collect the information on related research including an archive of scientific articles and post-processing tools.



# Functions of LC for EPS SSF

Lead Centre shall:

- a) Select a group of modelling centres, including GPCs-SSF that participate in the activity 2.2.3.x, to contribute to the Lead Centre(s) (the “contributing centres”);
- b) Provide the facility for contributing centres to automatically deposit their EPS data as defined in Appendix 2.2.yy;
- c) Maintain an archive of the EPS data from individual contributing centres;
- d) Make available (on a password-protected website, as needed) agreed EPS products (Appendix 2.2.yy) in standard format with a delay of 3 weeks after the forecast initial time for research and educational purposes;
- e) Monitor the received EPS data and consult with the relevant contributing centres if data are missing or suspect;
- f) Collect from the contributing centres information on any changes to their EPSs;
- g) Maintain a statistics of registered users and data downloads and summarize the statistics on a yearly basis;
- h) Provide on its website(s) :
  - Relevant documentation, including access to the EPS data and links to the websites of the contributing centres;
  - The list of the active contributing centres and the specification of their EPSs.

The centre(s) should also

- a) Collect the information on related research including an archive of scientific articles and post-processing tools.





# Way Forward

- Proposed the establishment of LCs and designation of Centres to INFCOM-2 (Oct 2022)
- Endorsed the INFCOM's recommendation by EC (2023)
- Transition period from research to operation (2023-2024)





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Thank you