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GIFS-TIGGE DEVELOPMENTS

(Submitted by Philippe Bougeault and Zoltan Toth (co-chairs of the GIFS-TIGGE WG))

The attached paper is a report from the recent meeting of the GIFS-TIGGE Working Group which met in the Chinese Meteorological Administration Beijing (21 to 22 March 2007). The Chinese hosts are to be congratulated for the excellent arrangements made for the meeting and the warm welcome and hospitality shown to the participants.

Summary of GIFS-TIGGE 4th Meeting CMA, Beijing, 21-22 March 2007

Attendees: Philippe Bougeault, Zoltan Toth, Chen de Hui, Beth Ebert, Dong-Joon Kim, Richard Swinbank, Laurie Wilson, Yoshi Takeuchi, Warren Tennant, Tiziana Paccagnella, Datong Zhao, Hee-Sang Lee, Steve Worley, David Parsons, Len Barrie, Qingliang Zhou, Jiao Meyan, Shi Peiliang

Apologies: Barbara Brown, Martin Ehrendorfer, Tom Hamill, Ken Mylne

Note: all presentations will be available from the TIGGE Internet Site at ECMWF
<http://tigge.ecmwf.int>.

1. Opening ceremony

The meeting was opened by welcome messages from Zheng Guoguang, deputy administrator general of CMA (who has been now appointed as administrator general), and Len Barrie, Director of WMO/AREP.

2. Report from the 3rd GIFS-TIGGE meeting

The report from the 3rd GIFS-TIGGE WG meeting (Landshut, December 2006) was approved by the group.

3. Progress of TIGGE at CMA

The progress of TIGGE at CMA was presented by Mrs Jiao Meyan, Director of the National Meteorological Centre and Mr. Shi Peiliang, Director of the National Meteorological Information Centre.

CMA as a data provider: Recently CMA has upgraded its global ensemble prediction system, and its initial contribution to TIGGE will be based on a 15-member ensemble at T213. Initial perturbations are based on the BGM method and will later evolve towards the ensemble transform method. TIGGE fields in GRIB2 are essentially ready and test of data transmission to ECMWF have been conducted since January 2007. In the near future CMA will work on multi-model ensemble assessment based on TIGGE archives.

CMA as an archive centre: the infrastructure has recently been upgraded (a Linux Cluster IBM X3850 with GPFS has been procured). The Internet connection has also been upgraded and data transfers with Europe and North America now occurs at sufficient speed. The Unidata Internet Data Distribution system (IDD)/Local Data Manager (LDM) is under test for data exchanges with several centres. Data are still being lost during transmission, and investigation of the problem will continue with help from NCAR and Unidata. The capability to encode/decode GRIB2 fields is now complete. The file management and storage system which will be used for the TIGGE archive has not yet been decided (it could be MARS from ECMWF or a CMA proprietary system). The full TIGGE service at CMA is expected to open before the end of 2007.

Shi Peiliang recommended that TIGGE be made WIS-compliant, and it was agreed that the WG will be briefed about the WIS at its next meeting. In particular, is-it possible that TIGGE metadata could be stored in WIS-compliant format?

ACTION: Ask THORPEX Data Policy and Management Working Group (DPM WG) for advice on most suitable format for storing TIGGE metadata. Shi Peiliang and Richard Swinbank can be consulted.

Possible use of GLORIAD was mentioned for exchanging large amounts of data. Whether this telecommunication framework designed for exchange of research data could be utilized for TIGGE/GIFS is an open question.

Action: Ask THORPEX Data Policy and Management Working Group (DPM WG) to explore potential use of GLORIAD based on CMA experience

4. Status of Phase 1

Archive centers:

Steve Worley presented the progress of TIGGE at NCAR. IDD/LDM is found to work well for data exchanges (it supports 172 Gbytes/day and will be able to accommodate more). Data from 4 providers (ECMWF, NCEP, UKMO and JMA) are received routinely at NCAR. CMA contributions are expected soon, with KMA and MeteoFrance to follow in 2 months. There are still many missing single level fields from all providers. NCAR processes and retransmits most NCEP data to ECMWF. The data in the NCAR archive is stored in files of 4 types (surface, pressure level, potential temperature, and potential vorticity). The NCAR TIGGE Internet portal already offers many possibilities to explore the archive and download data. NCAR has registered about 30 users and some data are being downloaded (only global fields in files at this stage). NCAR currently offers a number of software solutions to process the data at the users' site. These solutions are currently considered to be foundation steps and further development is needed so users can more easily manipulate ensemble data in GRIB2 format. NCAR will now put its priority on developing the direct access to user selectable parameter fields, interpolation of global data to common grids, and spatial subsetting. Steve noted that the pace of progress at NCAR is still very much dependent on funding requests. A longer-term goal is to mutually design web services for the TIGGE Archives that would make the data access easy and identical from CMA, ECMWF, and NCAR.

Philippe Bougeault summarized the status at ECMWF. Data are received routinely from 4 providers, most other providers have started tests of data transmission, it is expected to have 5/6 providers routinely very soon, and 10 providers by end 2007. Occasional data gaps are very limited and not considered a problem at the moment. Missing fields are the same as mentioned in the NCAR presentation. ECMWF is monitoring routinely the received data and has been able to point a number of problems of units, signs, etc... A list of these problems was circulated and discussed during the meeting (reproduced as Annex to this report). In most cases, corrective action will be taken very soon, and no single problem was considered as blocking. As a consequence the data base should quickly become nominal (except for those fields not yet delivered by the providers). Data access is currently possible only for MARS-registered users, which is very limited (only 3 or 4 users currently). Interpolation on limited area lat-lon grids is available through MARS. ECMWF will now put its priority on

developing the Internet access portal and the connection between this data portal and MARS
– This should be ready in 1-2 months.

CMA is expected to open up their TIGGE archive later in 2007.

A tour de table established the following status of data delivery:

ECMWF: nominal except 3 missing fields

UKMO: nominal except 3 missing fields

JMA: nominal except 10 missing fields, will move from http to LDM soon

NCEP: all specific humidity fields missing plus some single level fields missing, but this (except sunshine duration, expected by Sept 2008) should be solved by September 2007 (processing by NCAR, subject to funding) the specific humidity, the PV on 320K surface, and the near surface (2m) dew point will likely be ready sooner

CMA: on-going transmission tests, production starts soon

KMA: on-going transmission tests

Canada: on-going transmission tests, production expected mid-June for the essential data and all fields by end 2007

BMRC: GRIB2 encoding now resolved – essentially ready to start transmission tests

Meteo-France: transmission tests should start in May

CPTEC: on-going work on GRIB2, on-going transmission tests with LDM

Metadata: following discussion at the 3rd meeting, the proposal has been reviewed and circulated by the ET-EPS. The latest version regarding the content was agreed by the WG. Some more work will be needed to check whether it is possible to comply with WMO WIS standard formats for metadata (to be pursued by ET-EPS in collaboration with Mr. Shi Peiliang).

The group asked about dissemination of data in NetCDF format. It was agreed that this should still be an objective, but to be pursued with a lower priority. Zoltan Toth suggested that this should be postponed to Phase 2.

In conclusion, there is very good progress towards building the data archive. The last issues are now being resolved and the archive centres expect to have all 10 data providers and most fields by end 2007. The excellent collaboration between the 3 archive centres was noted with great satisfaction. Currently NCAR has a lead in data distribution, ECMWF will need 2 more months to start a service, and the CMA service is expected to start in 6 to 9 months. Priority will now be put on tools to access and manipulate data (interpolation to limited area lat-lon grids and further developments of the data portals).

5. Support for the Beijing RDP

The requirements for the Beijing Olympics 2008 RDP/WWRP-WMO were presented by Dr. Duan Yihong, deputy director of the NMC. This project will develop a multi-model limited area EPS approach at high resolution. The participating systems are from CMA (GRAPES_meso EPS), NCEP (new version of SREF), MSC (regional EPS), JMA (global/meso-scale EPS), NCAR (WRF system) and the Austrian weather service and Météo-France joint system (ARPEGE/ALADIN/AROMECA).

The project would benefit from

- access to the existing TIGGE database in real time for early warnings of severe weather (6-hourly time intervals).
- real-time delivery of lateral boundary conditions from various global models in order to drive the LAMs (at 6-hourly intervals, though access to data at 3-hourly intervals would be preferred).

After discussion it was agreed that real time access to existing TIGGE data will be requested through the IPO (and should be granted). CMA would like to make the first effort to develop its own products for early warnings of severe weather based on the available TIGGE data (e.g. CMA's), and welcome the technical supports from the TIGGE group.

On the other hand, support for LAMs lateral boundary conditions is not possible with current TIGGE data. Some TIGGE data providers may want to provide special datasets to support the RDP.

ACTION: A precise request needs to be formulated by the groups operating the LAM EPSs for the BeiJing RDP towards specific data providers by 15 June

ACTION: It was recommended that the Beijing Olympics LAM ensemble work be considered as a TIGGE LAM experiment, and coordination should be established between the TIGGE LAM subgroup of the TIGGE/GIFS WG and the Beijing Olympics LAM ensemble activities. The use of TIGGE formats in the Beijing RDP is recommended. The liaison between the BeiJing RDP and the TIGGE-LAM panel of experts is highly recommended. It is also recommended that the added value of LAM ensemble above what is achievable using the global TIGGE dataset be evaluated as part of the Beijing verification activities.

CMA will undertake to archive all special datasets provided for BeiJing RDP using a system fully compatible with its TIGGE archive.

Tests for the Olympics will take place: 24 July – 24 Aug 2007. The Olympics will run from 8 Aug through 24 Aug (with additional activities stretching through 9 Sept). To insure success, TIGGE-related forecast activities are expected to be tested several months prior to the start of the Olympics.

6. TIGGE-LAM subgroup activities

Tiziana Paccagnella, chair of the newly appointed TIGGE-LAM panel of experts, presented a provisional report on the on-going and planned activities. This was noted and endorsed by the WG. In particular, the WG expects that a proposal will be made by TIGGE-LAM for the concept of a general coupler between global and regional ensembles. The two options are:

- a) Use global driving data provided on regular lat/lon grid on standard pressure levels. Advantage: All LAM models/groups can use same software when coupling with any TIGGE global data. One set of coupler can serve all TIGGE applications in each group. All or most TIGGE providers are capable to deliver data in this format.
- b) Use native model variable and level data from global driving ensembles. Advantage: Only one set of interpolation (instead of two above), less loss of information? Disadvantage: All LAM groups to develop software to interpolate to their application from all different global model outputs; no standard data format.

Z. Toth raised the question whether concerns are real regarding loss of information from double interpolation under (b) above. He argued that if interpolation errors are random (as they should be) such small errors should have no significant impact on an ensemble of forecasts (ensemble mean should filter out some of the added noise).

It was noted that TIGGE-LAM will at some stage need a physical meeting – funding is to be sought from the IPO.

ACTION: The group recommended involving the THORPEX regional committees in the work of the TIGGE LAM panel. By the nature of TIGGE LAM, activities will be coordinated regionally. The goal of the TIGGE LAM is to assure that to the extent possible; the same standards are used in each region so research ideas and results can be easily shared among various TIGGE LAM groups.

ACTION: It was also recommended that TIGGE LAM takes BeiJing RDP as a concrete example to develop its proposals.

7. Status of, and plans for, Phase 2

Zoltan Toth introduced this subject, reaffirming that the Global Interactive Forecasting System GIFS is a long-term objective for TIGGE, key to THORPEX.

A future GIFS may include a global observing system that can be adjusted to meet the observational needs of the day; data assimilation systems that adapt to the varying data coverage and user requirements; Numerical Weather Prediction methods, including ensemble forecast systems, that will be configured interactively, i.e. by forecaster and end user needs, to provide the most critical and highest quality information in response to varying user needs; and a user interface, including applications procedures, that will allow individual users to respond in the most efficient manner to expectations about future weather.

TIGGE is an evolutionary project. In TIGGE PHASE-1 we focus on a data archive, plus near-real time access. This is both centralized (3 data repositories with identical data) and diversified (the data access mechanisms will not be the same for the 3 archive centres). In PHASE-2, we must strive to develop a real time data access in addition to the data archive.

The concept is moving towards a distributed archive (about 10 data repositories, with no duplication of data, and no need to ship very large amounts of data in real time) and a unified access mechanism.

There are many issues to address before developing this new approach (data policy issues, how to best share developments, how to organize production, e.g. where should de-biasing or products be done, etc...). NAEFS can be used as a model for some of these issues.

In the following discussion it was noted that some aspects of the GIFS will need input from other THORPEX groups before GIFS-TIGGE can work on them (e.g. adaptive data assimilation needs research from DAOS, products presentation needs input from SERA) and that TIGGE/Phase 2 (a distributed data base system offering fast real-time access) is a necessary technical step for the GIFS. Several centres will need to see results from Phase 1 before anything else can be started. However, Phase 2 in itself will take several years to develop, so planning needs to start soon in order to secure funding. A prototype for GIFS is to be tested before the end of the THORPEX program in 2014 (even earlier), and initial efforts will be directed toward the ensemble forecast component of GIFS.

A subgroup was appointed to explore the various issues of the GIFS and Phase 2 and to report to TIGGE WG by Sept 2007 (Beth Ebert, Richard Swinbank, Warren Tennant, Zoltan Toth).

8. Observations / 9. Verifications

This broad area was introduced by presentations by Zoltan Toth, Laurie Wilson and Beth Ebert. Some of the material for these presentations had been contributed by Barbara Brown, who could not attend the meeting. This was followed by a broad discussion, in which the group was able to agree on a list of desirable features and to start discussing the main issues and opportunities for the evaluation of global (and regional) ensemble forecasts in the TIGGE archive.

Observations:

Firstly, it is of course anticipated that many users will conduct verification against observations. Therefore it is desirable to provide access to observations for the research based on TIGGE archives. The TIGGE/GIFS WG, however, does not see the provision of observational data as part of its charter. The WG, however, will work with other interested parties to ensure access to TIGGE ensemble data and observational data are coordinated. There was consensus that TIGGE does not have the resource to build its own observational dataset. The TIGGE portals should direct users towards existing observational datasets.

Z. Toth reported the interest of D. Waliser (NASA, USA) in work related to the "Tropical Year" in 2008/09:

- a) D. Waliser indicated a possible request from the Tropical Year community for TIGGE to provide a few additional variables in the TIGGE archive related to convective and related processes. The TIGGE/GIFS WG gave a positive response, as long as the variables are available at the producing centers.

ACTION: The Tropical Year community (D. Waliser) to prepare and send to the TIGGE/GIFS WG co-chairs a list of requested variables as soon as possible.

- b) D. Waliser expressed interest in providing access to the community to specific satellite observations in a way consistent with TIGGE. The TIGGE/GIFS WG strongly encouraged such development and expressed an interest in collaborating with D. Waliser in his endeavour.

S. Worley and D. Parsons briefly described some observational data archived at NCAR that could be linked to the TIGGE archive. NCAR can offer a global observational dataset (based on NCEP observations, with quality flags arising from NCEP data assimilation) and computing resources to conduct verification activities.

ACTION: It will be necessary to seek CBS help to identify a set of reliable surface observations.

Verification:

The group strongly felt the need for standardized verification procedures, fair to all forecasting systems, and allowing for objective decisions concerning the future of the GIFS. In particular it is central to TIGGE objectives that one or several versions of a multi-model forecasting system be verified systematically and compared to single-model systems in a fair way.

This will require fair verifications against the various analyses (e.g. verify against each of the existing analyses), and verification against a common set of high quality observations, with common algorithms. It was discussed that both observations and numerical analysis can be used to evaluate TIGGE forecasts. Both data sets have various errors and it is important that the errors be assessed and carefully considered in the verification process.

It is desirable that these verifications of TIGGE forecasts become available routinely at some central facility, not depending on individual research projects. The TIGGE/GIFS WG agreed that the JMA ensemble verification web page, coordinated under the CBS Expert Team on Ensemble Prediction can serve as a coordinating mechanism and place to deposit TIGGE verification information. Y. Takeuchi expressed an interest on JMA's part to continue as a lead center for ensemble verification. Also, the format of verification information for TIGGE data, where appropriate, can follow the conventions laid out by the Ensemble Prediction Expert Team.

The initial priority for these routine verifications was agreed to be against surface conventional observations (2mT, 10m wind, precip) and radiosonde observations. Note that the Expert Team on Ensemble Prediction has not yet considered verification against observations.

The TIGGE/GIFS WG recognized the need for continued collaboration in the area of TIGGE verification between:

WGNE Verification team: They agree on standards for existing methods and develop new methods of verification

Ensemble Prediction Expert Team: They agree on how standard algorithms are applied in general for ensemble applications

TIGGE/GIFS WG: Agrees on special procedures for comparing TIGGE multi-center forecasts with single center ensemble forecasts

Issues related to standardized verification of TIGGE forecasts:

Verification software should be shared among the participants inasmuch as possible. A software or algorithm “toolkit”, shared among all TIGGE participants, is encouraged.

Work will continue at each forecasting centre to verify individual ensembles, with increased standardization. There was consensus to rely on the guidance of WGNE-WWRP verification WG and ET-EPS to improve standardization of verification algorithms and their application.

A place to develop verification for the multi-model ensemble is not yet identified. Although interest exists in several centres, no centre can already commit workforce. Systematic verifications at the archive centres are an option, but all 3 centres felt it is too early to commit – the issue will need to be revisited soon.

There was a strong consensus to use the JMA verification Internet site to display results of TIGGE standardized verifications.

A special effort for TC forecasts verifications was agreed. Beth Ebert will explore the format of TC forecasts, then data providers and archive centre will examine the possibility to add this information to the TIGGE archive. If possible, this will be used this during T-PARC (Summer 2008).

10./11. Links between TIGGE and GEO/SERA

This was introduced by a presentation by Dr. Lu Naimeng about the participation of CMA to the GEOSS. Dr. Zhao Datong, from the GEO Secretariat, recalled that many of the GEO objectives rely on TIGGE, for instance DA-06-03, HE-06-03, EN-06-03, WE-06-04, AG-06-05. A special mention is deserved for WE-06-03, which is TIGGE itself.

GEO support to TIGGE is strongly appreciated and TIGGE will try to meet GEO expectations – for instance by contributing material for the upcoming GEO ministerial conference.

It was noted that the help of the THORPEX IPO will be required to establish/maintain liaison with the GEO tasks where TIGGE is involved.

The group agreed to maintain a list of demonstration projects where TIGGE is used and to appoint a contact point for each of these. the current list is as follows: B08 RDP – Dr. Y.H.. Duan, T-Parc – D. Parsons, E-TREC – G. Craig, Winter 2010 Olympics – L. Wilson, SWFDP in South-Eastern Africa – W. Tennant. We should also seek to re-establish contact with HEPEX and give a TIGGE presentation at the 3rd HEPEX workshop (contact point: Z. Toth).

Finally a member of the WG was appointed to liaison with SERA (Laurie Wilson).

12. Plans for a TIGGE User workshop

There was consensus for the need to organize a User workshop to get feedback on the service delivered under Phase 1. This should take place about a year after the start of the service. Assuming the service could be declared open by mid-2007, the optimal time frame for a user workshop is the second half 2008.

It was felt desirable to tie this event to another THORPEX event (e.g. a 2-day workshop joined with the 3rd Thorpex science symposium). This should be re-visited after ICSC-6. SERA and GEO should be closely involved in the preparation of the User workshop. The offer from Chen De Hui, to provide feedback from the Shanghai EPS Workshop/WMO (to be held late 2007) was welcome.

13. Report to the ICSC-VI meeting

A set of slides was agreed to guide the report to the ICSC.

14. Working group membership

The group reviewed its membership, taking into account the THORPEX general policy of WG membership and the constraints due to the special nature of TIGGE as an infrastructure project supporting the science of several THORPEX WGs, and GIFS as a delivery mechanism for research to operations. The recommendation is to have members from each data provider organization and from the archive centres, and to maintain the links with the users (essentially the THORPEX science WGs) by inviting the co-chairs of all THORPEX science WGs to attend TIGGE-WG meetings or to send representatives. The TIGGE/GIFS WG co-chairs will provide detailed recommendations to the Director of the IPO/EB.

15. Next meeting

It was agreed that the optimal time-frame for the next meeting of the group is towards March 2008. The venue will be chosen after the ICSC-VI meeting.

The agenda of the next meeting should comprise inter alia the following items:

- Status of Phase 1 (including early science results)
- Progress of verifications
- The GIFS/Phase 2 concept developed by the subgroup
- Progress of TIGGE-LAM
- Status of the Beijing RDP
- Report of the Shanghai EPS Workshop/WMO-late 2007
- Review of plans for the User workshop
- Presentation on the WIS

Annex: TIGGE data archive status and data check result (as of 12 March 2007)

1. Data Status

	OCT 2006	NOV 2006	DEC 2006	JAN 2007	FEB 2007	MAR 2007
Operational						
ECMWF						
	From 1 Oct 06, 00/12UTC, 0-360h by 6h					
UKMO						
	From 1 Oct 06, 00/12UTC, 0-360h by 6h					
JMA						
	From 1 Oct 06, 12UTC, 0-216h by 12h (on test by 6h)					
NCEP	L					
	From 1 Nov 06 at NCAR. From 4 Mar 07, 00/06/12/18UTC, 0-384h by 6h					
Test						
CMA						
	From 22 Feb 07, 00/12UTC, 0-6h by 6h					

2. Data Check

(a) P level

Name	Abbreviation	Unit	Pressure Level (hPa)	Ecmwf Ecmf Prod	Ukmo Egrr prod	Jma rjtd test	Ncep kwbc test	CMA babj test
Geopotential height	gh	Gpm	1000					A
			925					A
			850					A
			700					A
			500					A
			300					A
			250					A
			200					A
Specific humidity	q	kg kg ⁻¹	1000					
			925					
			850					
			700					
			500					
			300					
			250					
			200					
Temperature	t	K	1000					
			925					
			850					
			700					
			500					
			300					
			250					
			200					
U-velocity	u	m s ⁻¹	1000					
			925					
			850					
			700					
			500					
			300					
			250					
			200					
V-velocity	v	m s ⁻¹	1000					
			925					
			850					
			700					
			500					
			300					
			250					
			200					

(b) Potential temperature level (theta=320K)

Name	Abbreviation	Unit	Ecmwf Ecmf Prod	Ukmo Egrr prod	Jma rjtd test	Ncep Kwbc test	CMA Babj test
Potential vorticity (new plot?)	pv	$K m^2 kg^{-1} s^{-1}$					

(c) Potential vorticity level (2PVU)

Name	Abbreviation	Unit	Ecmwf Ecmf Prod	Ukmo Egrr prod	Jma Rjtd test	Ncep Kwbc test	CMA Babj test
Potential temperature	Pt	K		B			
U-velocity	U	$m s^{-1}$					
V-velocity	V	$m s^{-1}$					

(d) Single level

Name	Abbreviation	Unit	Ecmwf Ecmf Prod	Ukmo Egrr prod	Jma Rjtd test	Ncep Kwbc test	CMA Babj test
10 meter u-velocity	10u	$m s^{-1}$					
10 meter v-velocity	10v	$m s^{-1}$					
Convective available potential energy	Cape	$J kg^{-1}$					
Convective inhibition	Ci	$J kg^{-1}$					
Field Capacity	Cap	$J kg^{-1}$					
Land-sea mask	Lsm	Proportion			C		
Mean sea level pressure	Msl	Pa					
Orography	Orog	gpm					
Skin temperature	Skt	K					
Snow depth water equivalent	Sd	$kg m^{-2}$			D	E	F
Snow fall water equivalent	Sf	$kg m^{-2}$					F
Soil moisture	Sm	$kg m^{-3}$					
Soil temperature	St	K		G			
Sunshine duration	Sund	s					
Surface air dew point temperature	2d	K					
Surface air maximum temperature	mx2t6	K					
Surface air minimum temperature	mn2t6	K					
Surface air temperature	2t	K					
Surface pressure	Sp	Pa					
Time-integrated outgoing long wave radiation	Ttr	$W m^{-2} s$			H		
Time-integrated surface latent heat flux	Slhf	$W m^{-2} s$			H		
Time-integrated surface net solar radiation	Ssr	$W m^{-2} s$					I
Time-integrated surface net thermal radiation	Str	$W m^{-2} s$					
Time-integrated surface sensible heat flux	Sshf	$W m^{-2} s$			H		J
Total cloud cover	Tcc	%					K
Total column water	Tcw	$kg m^{-2}$					
Total precipitation	Tp	$kg m^{-2}$					F
Wilting point	Wilt	Proportion					

- Colour index
 - green : OK
 - white : no data
 - red : problem
- Symbol explanation
 - A : CMA-may be multiplied by g(9.8), so J
geopotential not geopotential height
 - B : UKMO-too high around the tropics
 - C : JMA-0h data only
 - D : JMA- no data around north pole → maybe
different field
 - E : NCEP- different order, maybe different unit
 - F : CMA-different order(1/1000), maybe different
unit like [m] instead of [mm]
 - G : UKMO-land only, no data for ocean
 - H : JMA-opposite sign (downward positive for flux)
 - I : CMA- different order, maybe different unit
 - J : CMA-strange distribution (maybe problem with
data writing)
 - K : CMA-different unit, not %
 - L : Available only at NCAR. Fields may be missing
and not compliant with TIGGE parameter
encoding standards.