

INTERMAGNET Meeting Minutes

Public Edition

28 – 29 May 2023

Institute of Earth Physics and Space Science

Földfizikai és Űrtudományi Kutatóintézet, Sopron, Csatkai Endre u. 6, 9400

Hungary



Participants:

ExCon:

David Boteler (DB), NRCAN, Canada
Gautier Hulot (GH), IPGP, France
Ellen Clarke (EC), BGS, UK

On-Line

Kristen Lewis (KL), USGS, USA

OpsCom:

Stephan Bracke (SB), IRM, Belgium
Simon Flower (SF), BGS, UK
Benoît Heumez (BH), IPGP, France
Jürgen Matzka (JM), GFZ, Germany
Tero Raita (TR), U. Oulu, Sodankylä Obs, Finland
Jan Reda (JRD), IoG PAS, Poland
Chris Turbitt (CT), BGS, UK

Guest:

David Calp, NRCAN, Canada
Brendan Geels, USGS, USA
Alexandre Gonsette, RMI, Belgium
László Hegymegi, MinGeo, Hungary
Manjula Lingala, CSIR, India
Marcos C Siqueira da Silva, GFZ, Germany
Hiroaki Toh, Kyoto University.

On-Line:

Charles Blais (CB), NRCAN, Canada
Andrew Lewis (AL), GA, Australia
Virginie Maury (VM), IPGP, France
Benoît St-Louis (BSL), NRCAN, Canada

Not present during the meeting:

Shun Imajo (SI), KU, Japan
Roman Leonhardt (RL), ZAMG, Austria
Achim Morschhauser (AM), GFZ, Germany

Institute Abbreviations:

BGS – British Geological Survey
EPSS – Institute of Earth Physics and Space
Science, Hungary
GA – Geoscience Australia
GFZ – German Research Centre for Geosciences
IAGA – International Association of
Geomagnetism and Aeronomy
GNS – Geological and Nuclear Science, New
Zealand
IoG PAS – Institute of Geophysics, Polish
Academy of Science

IPGP – Institut de Physique du Globe de Paris,
France
IRM – Institut Royal Météorologique, Belgium
KU – Kyoto University, Japan
NGRI – National Geophysical Research
Institute, India
NRCan – Natural Resources Canada
MinGeo –
SGO - Sodankylä Geophysical Observatory,
Finland
USGS – United States Geological Survey
ZAMG - Zentralanstalt für Meteorologie und
Geodynamik, Austria

Table of contents

1	Preliminaries.....	8
1.1	Meeting format	8
1.2	Welcome and Introductions	8
2	Committee structure and membership	9
2.1	Executive Council (ExCon).....	9
2.2	Operations Committee (OpsCom)	9
3	Agenda, minutes and membership	9
3.1	Agenda.....	9
3.2	Approval of minutes from September 2021 on-line meeting.....	9
3.3	Changes to membership.....	10
3.3.1	ExCon Chair.....	10
3.3.2	Resignations.....	10
3.3.3	New Members.....	10
3.3.4	Election of OpsCom Chair.....	10
4	Presentation of Guests	10
5	In-camera discussions.....	11
5.1	Session 1	11
5.2	Session 2	12
6	Meeting agendas.....	13
6.1	Technical Manual.....	13
6.2	GIN, World Wide Web and Data	13
6.3	Definitive Data.....	14
6.4	IMOs and Standards.....	14
7	Plenary discussions and presentations.....	14
7.1	Recent Change in INTERMAGNET.....	14

7.2	Publication of 1-second data	15
7.3	Definitive data publication	15
7.4	IMOs in the Russian Federation	17
7.5	Issues relating to the pandemic	17
7.6	Kiev magnetic observatory	18
7.7	Real-time data transfer	18
8	Action items from September 2021 online meeting.....	18
8.1	Outstanding items from previous meetings	19
8.2	Secretary Correspondence	20
9	Next meeting.....	20
10	Decisions and action items.....	20
10.1	Decisions.....	20
10.2	Action items.....	21
11	Executive Council	22
11.1	Meeting overview.....	22
11.2	Participants	22
11.3	Decisions and action items	22
11.3.1	Decisions.....	22
11.3.2	Action items.....	22
12	Definitive data subcommittee	24
12.1	Meeting overview.....	24
12.2	Participants and mentions.....	24
12.3	Agenda.....	24
12.4	Review of actions items from 2021 September online meeting.....	24
12.5	Presentations relating to DD Subcommittee	25
12.6	Reports on 1-minute and 1-second definitive data collection.....	25

12.7	Issue of absolute measurements during the pandemic.....	25
12.8	Definitive data and IMOs of concern.....	26
12.9	Data checking in the context of the war in Ukraine.....	26
12.10	Completion of work related to the IVFV format change.....	26
12.11	Definitive 1 sec data on the web and as DOI.....	26
12.12	GFZ Summary statistics following archive migration to Edinburgh.....	26
12.13	Country maps in DOI publications.....	27
12.14	Baselines from automatic absolute measurement.....	27
12.15	Acknowledgments for definitive data acceptance.....	27
12.16	Dependencies between real-time and final data on the web.....	27
12.17	Other Matters for Discussion.....	27
12.18	Action Items from Sopron 2023 meeting.....	27
13	GINS/WWW and Data Formats Subcommittee.....	29
13.1	Meeting Overview.....	29
13.2	Participants.....	29
13.3	Agenda.....	29
13.4	Review of Action Items from previous meetings.....	29
13.5	Real-time data transfer.....	30
13.6	Migration of INTERMAGNET.org domain to GitHub.....	31
13.7	Baseline Values (BLV) file format.....	31
13.8	Liaison with the World Data System (WDS).....	32
13.9	Decisions and action items.....	32
13.9.1	Decisions.....	32
13.9.2	Action Items.....	32
14	IMO Applications and Standards Subcommittee.....	33
14.1	Meeting overview.....	33

14.2	Participants	33
14.3	Agenda.....	33
14.4	IMO action Items from the 2021 September online meeting	33
14.5	IMO Applications	34
14.5.1	IMOs closed or withdrawn since the March 2021 meeting	34
14.5.2	Update on previous applications:	34
14.5.3	New and re-applications:	34
14.5.4	Prospective IMOs	34
14.6	IMOs of concern.....	34
14.6.1	Resolved IMO issues since last meeting.....	34
14.6.2	Russian Federation observatories – data checking on hold:.....	34
14.6.3	Impact of the pandemic on 2020-2022 data	34
14.6.4	IMOs currently listed as non-compliant.....	35
14.6.5	Lists of IMOs of concern and IMOs awaiting checking.....	35
14.6.6	Status of the discussion document on the IMO one-minute data checking procedure.....	35
14.7	Discussion on the future supply of DI-fluxgate theodolites	35
14.8	IMO Subcommittee action items and decisions.....	35
14.8.1	Decisions.....	35
14.8.2	Subcommittee action items:.....	36
15	Technical Manual Subcommittee.....	37
15.1	Meeting overview.....	37
15.2	Participants	37
15.3	Agenda.....	37
15.4	Action items from September 2021 meeting	37
15.5	Committee membership, chair	40
15.6	Technical Manual.....	40

15.6.1	Digital Object Identifier (DOI) for the Technical Manual	40
15.6.2	ReStructuredText version.....	40
15.6.2.1	Conversion progress.....	40
15.6.2.2	Integration with WEB site and domain name	40
15.6.2.3	Comparison with V-5.0.0.....	40
15.6.2.4	How to submit content/corrections.....	41
15.7	Web.....	41
15.7.1	Closure of intermagnet.org	41
15.7.2	Links to data format in the Technical Manual	41
15.7.3	Other links to/from the web site.....	41
15.7.4	Policy and Technical notes to be published	41
15.7.5	FAQ maintenance	41
15.8	Round table.....	41
15.9	Decisions and Action Items.....	41
15.9.1	Decisions.....	41
15.9.2	Action Items.....	41
15.10	Schedule next video conference.....	43
16	Appendix	44
16.1	Meeting Agenda	44
16.1.1	Sunday 28 May Plenary session	44
16.1.2	Monday 29 May Subcommittee and ExCon sessions	45
16.2	IMO Subcommittee Report and discussion on IMOs.....	47

INTERMAGNET Meeting Minutes

This public edition of the minutes has been edited to remove some material relating to individuals, observatories or institutes. Throughout these minutes, references to subcommittees and committee members are identified using the abbreviations shown in section 2 below and initials included in the list of participants.

1 Preliminaries

1.1 Meeting format

This was primarily a face-to-face meeting held in the offices of the Institute of Earth Physics and Space Science in Sopron, Hungary. On-line facilities were available, and some participants contributed solely via on-line means. Video and audio recordings of most sessions were made to assist in preparation of minutes.

The dates and some other details for the meeting were agreed via an on-line poll held in January 2023. Some subcommittees had also set up online issue tracking on GitHub to allow discussions to take place before and after the meeting. These areas of discussion are listed here:

<https://github.com/INTERMAGNET/wg-www-gins-data-formats/issues>

<https://github.com/INTERMAGNET/wg-definitive-data/issues>

<https://github.com/INTERMAGNET/wg-tech-man/issues>

The INTERMAGNET email lists hosted by GFZ were available throughout the meeting for messaging and general announcements.

opscom_intermagnet@gfz-potsdam.de *

excon_intermagnet@gfz-potsdam.de

* New addresses for these email lists were announced after the meeting:

intermagnet_excon@listserv.dfn.de

intermagnet_opscom@listserv.dfn.de

1.2 Welcome and Introductions

The meeting was hosted by the Institute of Earth Physics and Space Science and held at their offices in Sopron, Hungary. This meeting followed on from the 19th IAGA Geomagnetic Observatory Instruments, Data Acquisition and Processing which was held at EPSS and Tihany observatory.

DB expressed his thanks to the hosts, welcomed and thanked participants and their institutes for attending. SF explained the logistics of the meeting and introduced some of the participants. Committee members and guests introduced themselves. Guest introductions are summarised below.

2 Committee structure and membership

2.1 Executive Council (ExCon)

David Boteler*
Ellen Clarke
Gauthier Hulot
Kristen Lewis

2.2 Operations Committee (OpsCom)

Chair Simon Flower*
 Secretary Andrew Lewis

Subcommittees (at the time of this meeting)

Definitive Data (DD)	GINS/WWW/Data Format (GWD)	IMO Applications and Standards (IMO)	Technical Manual (TM)	Instruments and Data Acquisition (IDA)
Jan Reda* (P)	Charles Blais* (P)	Chris Turbitt* (P)	Benoît St Louis* (P)	
Achim Morshhauser (S)	Achim Morshhauser (P)	Andrew Lewis^ (P)	Andrew Lewis (P)	Achim Morshhauser (S)
Andrew Lewis (S)	Jan Reda (P)	Benoît Heumez (S)	Chris Turbitt^ (P)	Benoît Heumez (S)
Benoît Heumez^ (P)	Roman Leonhardt (P)	Benoît St-Louis (P)	Jürgen Matzka (P)	Benoît St Louis (S)
Charles Blais (P)	Shun Imajo (P)	Jürgen Matzka (P)	Stephan Bracke (S)	Chris Turbitt (S)
Roman Leonhardt (P)	Simon Flower (P)	Tero Raita (S)		Jürgen Matzka (S)
Shun Imajo (S)	Stephan Bracke (P)	Virginie Maury (S)		
Simon Flower (P)	Virginie Maury (P)			
Tero Raita (P)				
Virginie Maury (P)				

* Chair of council/committee/subcommittee; ^ Deputy Chair of subcommittee
 (P) Primary affiliation; (S) secondary affiliation

3 Agenda, minutes and membership

3.1 Agenda

The main agenda for the meeting is available in the appendix (section 16.1). Sub-committee meeting agendas are included in the sub-committee sections below. There were no additional items suggested for the agenda.

3.2 Approval of minutes from September 2021 on-line meeting

Minutes from the previous on-line meeting held in September 2021 were published in March 2022. The process of publication included review and acceptance of those minutes by the committee so further approval was not required during this meeting.

3.3 Changes to membership

3.3.1 ExCon Chair

David Boteler (DB) was appointed as the new ExCon chair after Alan Thomson resigned from the position after the last meeting.

3.3.2 Resignations

- Although SF gave notice to step down as the OpsCom chair after the previous on-line meeting in September 2021 he continued in the role for this meeting. At the end of this meeting SF reiterated he is no longer available as OpsCom chair.
- Alan Thomson resigned as chair of ExCon after the last meeting.
- BSL resigned from OpsCom and his role as chair of TM at the conclusion of this meeting.
- Sergey Khumotov resigned from OpsCom in November 2022.

3.3.3 New Members

- Ellen Clarke (EC) joined ExCon as the BGS representative.
- Shun Imajo (SI) was accepted as an OpsCom officer in February 2022. SI represents the Kyoto GIN and is a member of the GWD and DD subcommittees.

3.3.4 Election of OpsCom Chair

An election for a new OpsCom Chair will be arranged after this meeting. The election process will follow the procedures set out in policy note 4. As the outgoing Chair, SF will act as the returning officer for the election.

4 Presentation of Guests

Guests introduced themselves

- Marcos V Siqueira da Silva, GFZ, Niemegk, working on data processing and calibration. Marcos is interested in DD and GWD to complement JM's participation in TM and IMO.
- László Hegymegi, former OpsCom officer, now working with MinGeo, a private company developing observatory instrumentation. László is interested in attending the TM subcommittee discussions.
- David Calp, NRCAN, magnetic observatory operations team working on producing and checking observatory data. David is interested in the real-time data transmission discussion in GWD
- Alexandre Gonsette, RMI working on instrumentation and development of automatic DIFlux, in charge of Belgium observatories in Europe and Antarctica and working with other institutes in Latin America to improve and establish observatories. Alexandre planned to attend the IMO subcommittee but also attended sessions from other subcommittees.
- Manjula Lingala, NGRI, working at Hyderabad observatory on data processing. Manjula is interested in the DD discussions.

5 In-camera discussions

5.1 Session 1

A session to raise questions for later consideration.

DB and SF introduced issues and problems facing INTERMAGNET. INTERMAGNET relies on the dedication of a small number of people and some roles in the committees have significant work loads. There was agreement that some specific required skills are missing from the committee membership, in particular IT and Cyber security skills are required as these issues are now strong drivers for many decisions.

Other questions that were raised were around the ability for committee members to travel to meetings and whether hybrid meetings are the future?

Some discussion and consideration is needed on the structure of the committees and whether it remains appropriate. Do the roles of ExCon and OpsCom need changing. Do we need to bring more people into the committees? Recent retirements mean a new OpsCom chair and a new subcommittee chair are required.

GH asked what is the status of the observatories in each country?

DB noted there is an issue of lack of recognition and acknowledgement for ground-based monitoring. INTERMAGNET could champion the use of magnetic data to head-of-institute level managers to assist the internal technical staff.

CT raised the issues of problems with observatories from the Russian federation; problems due to the pandemic and whether INTERMAGNET policies need to be updated to manage these problems. There is now less capacity for assistance to struggling IMOs from those institutes with more resources.

AL noted that limited human resources and the weight of routine operations involved in running observatory networks makes it difficult to explore new projects.

BSL believes the INTERMAGNET committee lacks officers with sufficient IT skills.

JM believes INTERMAGNET committees have insufficient numbers of officers and is hampered in making timely decisions due to an accumulation of historic positions and rules. An INTERMAGNET policy department could perhaps resolve the problem. Too much effort is required by observatories and data checkers on small issues that do not produce meaningful benefits.

GH responded that ExCon is the body that should be fulfilling the role of decision making on policy issues and perhaps ExCon is not responsive enough in this task, although rules and policy are a necessary part of INTERMAGNET to define the requirements of membership of the network. Rules need to be followed but they must also be flexible enough to change when necessary. Many of the tasks required of INTERMAGNET repeat year after year and perhaps it would be possible to harness artificial intelligence to aid in some tasks that require expertise, while noting this will require considerable initial investment – the question is if this investment is worth making. It is almost inevitable that this will happen so should INTERMAGNET anticipate the development and provide guidance?

EC agrees with JM and suggested INTERMAGNET should be more flexible, citing the example of COVID induced delays to IMO data which puts IMOs in breach of INTERMAGNET's data policies.

CT asked if it was appropriate to have the same data quality rules for all observatories, while recognising there are some complications with different data quality standards for different IMO. Could there be a balance between data quality and data value for IMOs which are in difficult, remote locations but where their location itself increases the value of their contribution.

DB noted that the perfect can be the enemy of the good and INTERMAGNET should be helping observatories rather than making them comply with rules that do not add value.

JM thinks INTERMAGNET needs to have a two-tier network which would help data users identify high quality data while still supporting IMOs to remain within the network.

EC asked if this may create more work to define the tiers and classify the IMOs.

SF noted that a two-tier system already exists for observatory data with INTERMAGNET as tier 1 and the World Data Centre as tier 2.

TR suggested there are already large variations in data quality from IMOs and quality tiers or levels may provide IMOs with motivation for self improvement and be a driver for overall quality improvement throughout the network.

CT noted that it may also have the opposite effect of decreasing quality if IMOs are satisfied simply to be member of INTERMAGNET in the lower tier. Clearer guidelines and metrics on data quality, specifically noise and delta-F range, could be useful to solving some problems.

DB asked if INTERMAGNET should produce educational videos, but again this is a significant investment.

SF raised the idea of having administrative support for arranging meetings and should INTERMAGNET have funding and a bank account?

5.2 Session 2

Further consideration of some issues raised in session 1

ExCon considered issues raised in session 1 and considers the basic structure of INTERMAGNET has no serious issues but feels ExCon could make an increased contribution. In particular, the workload for arranging meetings falls entirely on the OpsCom chair and in the future ExCon will make a larger contribution to the arrangements. ExCon will contribute to meeting logistics including liaising with the local organiser and advertising the meeting. OpsCom chair will be responsible for the agenda and facilitating the sub committee arrangements.

Chair and secretary of OpsCom will become ex-officio member of ExCon. ExCon will meet every three months for updates on OpsCom activities and to ensure pressing issues can be dealt with in a timely manner without needing to wait for the next full INTERMAGNET meeting.

ExCon officers will also attend subcommittee meetings to provide ExCon with better visibility of issues in the subcommittees. ExCon will continue to meet at the beginning, middle and end of INTERMAGNET meetings and in between these ExCon meetings the ExCon officers can attend subcommittee meetings, but ExCon officers should not specialise to a specific subcommittee.

SF noted the arrangements for the meeting is a large workload and sharing this workload with ExCon will be helpful.

These decisions change the role of the chair of OpsCom and so the process of finding a new chair of OpsCom will be re-opened. The process for selecting a chair has been set out in a policy note.

ExCon also considered ways to improved engagement and bring new people into INTERMAGNET for two reasons:

1. To reverse the current trend of retirements and outgoing officers;
2. To avoid the perception that the INTERMAGNET committee is exclusive and not accessible to others within the IMO community.

Currently officers within OpsCom comprise the committee and subcommittee chairs and the subcommittee members. ExCon proposes a third tier of OpsCom membership of people who will not be assigned to any specific subcommittee. All IMOs will be asked for nominations, including basic information and skill set for the nominee. These new officers can attend the INTERMAGNET meetings and attend subcommittee meetings and volunteer to assist in specific tasks.

CT commented that new officers and their institutes must be clear about the commitment required. Staff turnover at institutes and IMOs means that the process will need to be repeated regularly.

AL noted that the members of the data checking team could be considered in this process and should receive some recognition.

SF reminded the meeting that it is actually the IMOs which are members of INTERMAGNET, not the people working in the subcommittees, so we must be careful to call for new officers of the OpsCom committee, not INTERMAGNET itself.

JRD asked about the rules for participation in INTERMAGNET, as unlike some other networks he is involved with, there is no formal agreement between an institute and INTERMAGNET.

GH stressed the point that INTERMAGNET does not have any legal status so cannot be involved in “memorandum of understandings”. INTERMAGNET can only recognise the value of the data from IMOs but cannot request or direct any work– everything is voluntary.

TR suggested we need to get more people to attend the INTERMAGNET meetings to speed up the process of bringing in new subcommittee officers.

JM welcomed the changes in ExCon and the ideas for new officers as a very good start, but he feels OpsCom also requires restructuring, and the data checkers should be involved in any restructure.

TR suggested IMOs deserve recognition for their data contribution. DB agreed and noted that data checkers should received more recognition.

CT noted that guests are welcomed to INTERMAGNET meetings and wondered if calling for nominations will actually work as well as hoped. DB asked if there has been much effort to invite guests. EC reiterated the point that there is community perception that INTERMAGNET is somewhat closed to outsiders.

JRD suggested acknowledgement from ExCon to institutes and IMOs is very valuable. Automatic confirmation and recognition for data when they are published would be good.

TR commented that it is very difficult to say how data are used, how much are used and who uses data.

SF mentioned the important issue of citation of publications using INTERMAGNET data and stressed the need to turn all the ideas covered in this session into actions for individuals to ensure ideas are progressed.

6 Meeting agendas

SF described the structure and responsibilities of the INTERMAGNET sub-committees and the format of the meeting - higher level discussions in plenary, followed by detailed discussions on specific topics within the subcommittee meetings.

Sub-committee chairs presented their meeting agendas, which are summarised in this section, details are available in the specific sub-committee sections below.

6.1 Technical Manual

BSL set out the main goal of TM subcommittee during this meeting is to finalise the new on-line format of the Technical Manual and make it live for community contributions, in addition to the integration of the manual into the new INTERMAGNET website on GitHub. Committee membership will also be considered in the light of BSL retirement as chair. There are significant issues with the website upgrades that require co-ordination with the GWD subcommittee.

6.2 GIN, World Wide Web and Data

SF presented the agenda on behalf of CB. The primary discussion will concentrate on real-time data exchange and deciding between Seedlink and MQTT as the data transport technology. Other issues for discussion include how to track discussion issues, porting the real-time magnetic activity map

application from the old web site to the new site and moving to more modern data formats beyond the ageing IAGA-2002 format.

6.3 Definitive Data

JRD explained the DD committee will examine progress on previous action items and discuss one second data collection. Other important issues are to continue the work of finalising a new format of the IYF “yearmean” file and the issue of publishing definitive one-second data, including DOI and meta data such as county maps for on-line DOI publications. The question of issuing letters to acknowledge contributions from IMOS to published data sets will also be considered.

There are several topics requiring co-ordination or joint discussions with the IMO subcommittee, including IMOs of concern; issue experienced by IMOs during the pandemic such as insufficient absolute observations; issues with data checking of Ukrainian IMOs in the context of the Russian aggression in Ukraine.

Additionally, a discussion on the best way to handle baseline values determined from automatic absolute observations system.

6.4 IMOs and Standards

CT presented the agenda for the subcommittee which will consider the issue of the Russian aggression in Ukraine and the impact of the pandemic on IMO operations and data as part of the plenary meeting. In collaboration with the DD committee discussions on IMOs of concern and non-compliant IMOs. There are applications to consider for two new observatories to join INTERMAGNET. Finally, a discussion to explore options on the supply of DI fluxgate magnetometers.

7 Plenary discussions and presentations

7.1 Recent Change in INTERMAGNET

A report on the current state of transferring operations from NRCAN to BGS

SF reported the INTERMAGNET data portal has now moved from NRCAN to BGS. The Canadian portal was shut at the start of May and services like those available from Canadian system are now available from the BGS portal. There has not been a lot of feedback on the change but generally the community seems happy. The one remaining task is for the four GINs to turn off their data feeds into the Canadian portal.

CB confirmed GINS are now being blocked from Ottawa.

There is now a web service to access data from the BGS portal. This will allow easy data access from anywhere on the internet and foster development of applications requiring access to data from any interested institute.

CT asked about the data embargo provisions and SF explained that data providers can set an embargo period on data to limit access to real-time data. Currently, any requests for data under embargo will simply appear to return missing data. There is a case for finer control on embargo setting than is currently available but this under consideration.

David Calp asked why INTERMAGNET is managing data embargos for institutes and DB and EC explained that INTERMAGNET needs access to data for some applications such as the magnetic activity map or graphical magnetograms that are not embargoed, whereas access to digital data may be under embargo.

DB asked if GINS are still necessary and noted that it is important that data remain available as spreadsheet compatible data files.

CB noted that while GINS are not required for technological reasons they are useful to spread the work across institutes to make the task at the BGS data portal more manageable.

GH asked about data redundancy and backup within the new BGS portal and SF confirmed the INTERMAGNET data in the portal are managed under the standard BGS IT system which meet government requirements so there are no concerns.

CB mentioned that some users still want an ftp folder structure maintained and SF noted that the BGS system does maintain an ftp server and directory structure, but users are being encouraged to transition to other available transport mechanisms as on-going support for ftp is becoming more difficult.

7.2 Publication of 1-second data

A summary of 1-second definitive data - JRD

RL is leading the work on 1-second definitive data checking and provided summary statistics on the current state of 1-second definitive data for the period 2019 – 2022. Data are automatically checked by the IMBOT system and classified as level 0 (incomplete); level 1 (minor issues); level 2 (passed all tests). The final stage of acceptance is a manual check by the data checking team.

Year	Submitted	IMBOT 0	IMBOT 1	IMBOT 2	Manual checking accepted
2019	49	2	12	35	3 (HLP, KDU, UPS)
2020	36	0	5	31	5 (CSY, EBR, HLP, KDU, UPS)
2021	12	0	2	10	0
2022	1	0	1	0	0

IMBOT includes comparing the one-second data against the definitive one-minute data. It has been observed that one-second data quality is improving as IMOs and data checkers gain experience.

GH asked if there have been any disagreements between the IMBOT checking and the manual checking. So far the results have been good. It must be noted that the submission deadline for 2021 data is 01 Oct 2023.

7.3 Definitive data publication

A comparison of one-minute and one-second definitive data by JRD

Submitting, checking, and publishing one-minute definitive data is a well established and well understood process within INTERMAGNET. Similar processes for one second data are still under development. The primary similarities and differences between the process for one -minute and one-second data are presented in the table below.

	1-minute def.	1-second def.
Format provided Definitive Data	IAF monthly files + metadata files (BLV, readme.obs, yearmean.obs, readme.cty, country_map, about_screen)	<ul style="list-style-type: none"> ImagCDF monthly files (12/year) ImagCDF daily file (365 or 366/year) without any metadata files
Elements required	XYZG (G=Fv-Fs is not obligatory)	Most often provided XYZG But possible others e.g. HDZG, HDZS Also possible to provide temperatures G,S, temperatures are not obligatory
Deadline delivery	Approximately 6 months after the end of the given year.	Approximately 1.5 years after the end of the given year. Remark: The such delay because accepted 1min definitive are used as a reference for checking 1sec definitive
Step1 (Delivery place)	ftp Paris ftp://userint@par-gin.ipgp.fr	ftp Paris ftp://user1sec@par-gin.ipgp.fr
Step2	ftp Paris ftp://userint@par-gin.ipgp.fr	ftp Paris ftp://cdfsteptwo@par-gin.ipgp.fr
Remark Step2	IAF files are exactly the same as provided by IMOs	IMBOT covertes files provided by IMOs to CDF monthly files
Step3 (so-called Intermagnet web)	https://imag-data.bgs.ac.uk/GIN_V1/GINForms2 ftp://ftp.seismo.nrcan.gc.ca/intermagnet/minute/definitive ftp service: imag-ftp.bgs.ac.uk	NO Step3 so far
DOI publication	YES	NO
Automatic checking	YES IMBOT based on check1min.exe	YES <ul style="list-style-type: none"> IMBOT based on MAGPY Python application IMBOT uses 1min data as a reference for controlling absolute levels. IMBOT assesses the quality on scale 0-2 (2-excellent data for human cross-checking)
Human data quality checking	Two stage human cross-checking: 1) By member of Data Checking Task Team 2) By member of Definitive Data Subcommittee who decides that data can be published as definitive on INTERMAGNET web and as DOI	Some annual sets have already been accepted by members of Data Checking Task Team However the issue of publishing 1sec definitive on INTERMAGNET web and as DOI is waiting for a solution.

Difference between one-minute and one-second data exists in the data formats, meta-data and magnetic components provided as well as the data submission deadlines and the checking process. In the case of one-minute data, the IAF data files provided by the IMO are exactly as published. In the case of one-second data IMBOT converts data files provided by the IMOs to monthly ImagCDF files. Checking of one minute data is mostly done manually, for one-second data checking is first done automatically by IMBOT, followed by manual confirmation.

There is not yet an agreed process to published fully accepted one-second definitive data.

DB questioned why there are differences in the geomagnetic elements required for one minute and one-second data and argued that consistency, simplicity and reducing workload are important. SF noted there is an issue with precision of angular components in IAF BIN files so XYZ components were mandated to maximise data precision for one-minute data. This limitation does not exist in the one-second data formats.

JM noted that the ImagCDF data format is very flexible and INTERMAGNET can add different components to ImagCDF files and leave the original components provided by the IMO in place in the file. DB asked if DD subcommittee was discussing the issue of one-second data publication.

EC noted that the submission deadline for one-second data is not actually a hard deadline as there is no data published so far.

JRD noted that data used to prepare the annual IRDS of one-minute data was sourced from the ftp server at the NRCan INTERMAGNET data archive, but since moving the archive to BGS there is no longer access to those data.

SF is unsure where the data for the IRDS in Canada was sourced (possibly from the Paris GIN) and this question needs to be investigated and resolved in the DD subcommittee.

7.4 IMOs in the Russian Federation

Discussion on status of IMOs within the Russian federation, CT and JRD

Parts of this section have been removed from this public copy of the minutes as it contained discussion about individuals, observatories or institutes.

CT reported there are 7 IMOs within the Russian Federation that are no longer complying with INTERMAGNET policy on definitive data timeliness, either because data have not been submitted or data have been submitted but not checked. There are a further 3 IMOs which will become non-compliant next year. Observatories are still operating but it seems that all the Russian observatories have had their Russian licence to export real-time data revoked. Two or three of the Russian observatories have contacted IPGP and GFZ about this. It can be expected that when communications are re-established with the observatories it will perhaps take some time to re-instate the licences.

CT suggested three options for the Russian observatories:

- 1) Continue as normal; accept data that is being provided and accept that any definitive data submissions will not be checked.
- 2) Enforce the INTERMAGNET policy and withdraw IMO status when definitive data have not been accepted after two years, even though the reason of non-acceptance maybe that INTERMAGNET has not checked data. IMOs would need to reapply in the future.
- 3) Suspend the status of the IMOs, do not publish data on the INTERMAGNET website site, and decide in the future how to proceed. If this option is adopted then the IMO involved must be informed.

7.5 Issues relating to the pandemic

A discussion on managing issues caused by the pandemic - CT

Parts of this section have been removed from this public copy of the minutes as it contained discussion about individuals, observatories or institutes

There are at least four IMOs affected by lack of absolute observations and observers over the pandemic period 2020-2021. One suggestion to deal with this is to allow observatories a period where definitive data are not published and then pick up data once the pandemic problems are resolved. There is a complication of some issues affecting data quality before the pandemic began.

DB suggested we need to be flexible and, as a general rule keep IMOs engaged with INTERMAGNET, so it is possible for them to resume as normal when the situation allows. DB suggests we notify IMOs of the unprecedented situations created by the Russian aggression and the pandemic and INTERMAGNET will suspend the usual requirements for affected observatories and revisit the situation at the next meeting.

GH agrees but wording of any statements must be careful.

ExCon will develop the wording for an official statement.

AL asked if it was clear which IMOs have been affected by the pandemic.

BH asked if anything can be done with data from observatories temporarily without absolute observations or variation stations and GH suggested we need clarity and boundaries to define what data are accepted by INTERMAGNET. SF commented that accepting variation data comes with additional work.

7.6 Kiev magnetic observatory

A request for assistance from Kiev observatory - JRD on behalf of Yuri Sumaruk

Kiev observatory became an IMO in 2011. The observatory was destroyed by the Russian military in February 2022 and used by the Ukrainian army for some time after that - it is currently nonoperational and requires new equipment, including magnetometers and computers. Assistance from the community to rebuild the observatory is welcome.

7.7 Real-time data transfer

A discussion on current options with the aim of moving to implementation - SF and CB

Real-time data transfer has been discussed within INTERMAGNET for several years and is now becoming more important. INTERMAGNET is behind other areas, such as seismology, in adopting real-time data transfer applications and some standards are required to progress the situation. The two methods for data transfer under discussion within INTERMAGNET are MQTT and Seedlink. These should be the focus for discussions within INTERMAGNET going forward.

GINs are currently using rsync to transfer data to the archive, but this is slow and inefficient. Seedlink is mainly a seismic data protocol, MQTT is used very widely. Of the 5 GINS within INTERMAGNET, two are using Seedlink, 3 are not using either Seedlink or MQTT. Some institutes associated with INTERMAGNET are using MQTT, some are using Seedlink. INTERMAGNET must make a difficult choice to either support one, the other or both protocols.

AL commented that Geoscience Australia has experimented with MQTT as a data transfer protocol. VM says the seismic group within IPGP uses Seedlink and the IPGP geomagnetism group is MQTT ready. SF considers there are three phases of this project:

1. Replace the rsync connection between GINS and the data portal
2. Open up the new real-time data connection to IMOs (Seedlink or MQTT), while retaining all existing protocols
3. Opening up delivery to data users

CB noted we are attempting to solve real-time data rather than archiving and backfilling and we need a well documented solution which can be implemented with minimal effort from the institutes.

AL asked if INTERMAGNET has a definition of real-time data and SF quoted the agreed definition is “within 2 minutes for 1 minute data and within 30 seconds for 1 second data”. The interesting question is how quickly can the user get the data.

SF noted that the next important step is to move to implementation as a pilot study and transition from discussion to action.

8 Action items from September 2021 online meeting

Action	Responsible	Description	Status (Green = completed, Orange
--------	-------------	-------------	-----------------------------------

			= ongoing; Red = not started)
P.A01	chairs/AL	Complete subcommittee reports, decision logs and action item list by 6 weeks after completion of the meeting	Done
P.A02	chairs	Supply a report on subcommittee activities for inclusion in the "Report to IMOs" by 6 weeks after completion of the meeting	Done
P.A03	SF	Complete a report to IMOs and distribute to IMOContacts, WorldObs and the INTERMAGNET web site by 12 weeks after completion of the meeting	Done
P.A04	AL	Complete draft minutes, including reports from subcommittees by 12 weeks after completion of the meeting	Done
P.A05	committee members	Review the draft minutes within 14 weeks after meeting	Done
P.A06	AL	Complete corrections and amendments to the minutes with 16 weeks	Done
P.A07	AL/OpsCom chair	Review minutes for publication	Done
P.A08	committee members	Review draft "public" minutes	Done
P.A09	AL	Upload minutes to INTERMAGNET document archive, publish the "public" minutes on INTERMAGNET web site and notify IMO-Contacts before the next scheduled meeting or no later than 24 weeks after completion of the meeting.	Done
P.A10	chairs	Arrange an online subcommittee meeting or document meeting before the next face to face meeting	Done at chairs discretion
P.A11	OpsCom chair	Request committee members for agenda items for inclusion at the next meeting and request chairs to create subcommittee agendas	Done
P.A12	OpsCom chair	Include item on next meeting agenda to seek views on effectiveness of INTERMAGNET's communication with community	Done
P.A13	OpsCom chair	Publish draft agendas 2 weeks before the next INTERMAGNET meeting	Done
P.A14	OpsCom chair	Decide on format and dates for next meeting	Done
P.A15	SF	Arrange election of new OpsCom chair during October and November 2021 and announce results to the community in Report to IMOs	Will be progressed during this meeting
P.A16	SF	Document procedures for election of OpsCom chair (in PN4)	Done

8.1 Outstanding items from previous meetings

Action	Responsible	Description	Status (Green = completed, Orange = ongoing; Red = not started)
--------	-------------	-------------	---

P.A03	SF	Complete a report to IMOs and distribute to IMOContacts, WorldObs and the INTERMAGNET web site by 12 weeks after completion of the meeting	Completed
P.A15	AL	OpsCom requests ExCon to consider the idea of “emeritus” INTERMAGNET officers. There may be some retired INTERMAGNET officers who have much experience and possibly time available to contribute to aspects of INTERMAGNET business	Not completed and requires further consideration at this meeting by ExCon
P.A18	AT	Arrange an INTERMAGNET discussion session during the next IAGA observatories workshop	This was done at the recent Tihany/Sopron workshop – could be considered part of a bigger item on communications of interest to ExCon
P.A21	SF	Generate metadata reports and provide via email to IMOs (in WDC call-for-data) asking for correction and feedback	In progress. Work has been done to generate database views for the reports but there is still no solution and needs more work
P.A28	SF	Investigate inclusion of metadata from “readme” files into DOI information (and definitive data IAGA2002 file headers) to describe known issues with definitive data	Not started - no longer realistic to continue

8.2 Secretary Correspondence

There has been no correspondence to the secretary since the September 2021 on-line meeting.

9 Next meeting

The next IAGA observatories workshop will be in Oct 2024 in Vassouras, South America. There is also a SWARM data quality workshop in late October 2024. JM offered Niemegek as a venue if there are no better offers. Generally, most committee members indicate it is better to run the INTERMAGNET meeting in association with another related event, such as the IAGA workshop.

The decision for the next meeting will be deferred for now with the intention to plan the next meeting for about a year from now. ExCon will manage the process of making the decision.

10 Decisions and action items

10.1 Decisions

Number	Description
P.D01	Rules will be relaxed for non-conforming IMOs from the Russian Federation, Ukraine and those affected by the pandemic
P.D02	Proceed to an election for OpsCom chair
P.D03	Restructure the role of ExCon

10.2 Action items

Some action Items considered in plenary sessions have been captured within the council and subcommittee action items in the sections below. Those actions items not fully included in the council and subcommittees lists are included here.

Action	Responsible	Description
P.A01	chairs/secretary	Complete subcommittee reports, decision logs and action item list by 6 weeks after completion of the meeting
P.A02	Chairs	Supply a report on subcommittee activities for inclusion in the "Report to IMOs" by 6 weeks after completion of the meeting
P.A03	OpsCom chair/secretary	Complete a report to IMOs and distribute to IMOContacts, WorldObs and the INTERMAGNET web site by 12 weeks after completion of the meeting
P.A04	OpsCom secretary	Complete draft minutes, including reports from subcommittees by 12 weeks after completion of the meeting
P.A05	committee members	Review the draft minutes within 14 weeks after meeting
P.A06	OpsCom secretary	Complete corrections and amendments to the minutes with 16 weeks
P.A07	OpsCom secretary /OpsCom chair	Review minutes for publication
P.A08	committee members	Review draft "public" minutes
P.A09	OpsCom secretary	Upload minutes to INTERMAGNET document archive, publish the "public" minutes on INTERMAGNET web site and notify IMO-Contacts before the next scheduled meeting or no later than 24 weeks after completion of the meeting.
P.A10	Chairs	As necessary, arrange an online subcommittee meeting or document meeting before the next face to face meeting
P.A11	OpsCom chair	Request committee members for agenda items for inclusion at the next meeting and request chairs to create subcommittee agendas
P.A12	OpsCom chair	Include item on next meeting agenda to seek views on effectiveness of INTERMAGNET's communication with community
P.A13	OpsCom chair	Publish draft agendas 2 weeks before the next INTERMAGNET meeting
P.A14	ExCon	Decide on format and date for next meeting and distribute information to the community.
P.A15	ExCon and SF	Make arrangements to elect new chair for OpsCom
P.A16	DB/SF	Provide a letter of appreciation to the local organisers (SF to provide a list of people involved)
P.A17	CT	Contact Yuri Sumaruk and acknowledge the presentation made during the meeting on behalf of Kiev observatory.
P.A18	BH	Investigate how "step 3" one-minute data were transferred to the NRCAN data archive and how best to proceed migrate that process to the BGS archive to allow preparation of future IRDS data sets.

11 Executive Council

11.1 Meeting overview

ExCon meetings were held in person on 28 and 29 May, with KL attending via video conference.

11.2 Participants

David Boteler, Ellen Clarke, Gauthier Hulot, Kristen Lewis

11.3 Decisions and action items

11.3.1 Decisions

Number	Description
EXC.D1	Expand ExCon to include the chair and secretary of OpsCom as ex-officio officers
EXC.D2	A new class of general committee member will be created and institutes invited to nominate candidate who could contribute to INTERMAGNET
EXC.D3	A new class of emeritus member will be created

11.3.2 Action items

Parts of this section have been removed from this public copy of the minutes as it contained discussion about individuals, observatories or institutes.

Action	Responsible	Description
EXC.AI-1	ExCon	Request institutes to contribute nominations for the new general members, including an explanation and form to gather the required information
EXC.AI-2	ExCon	Create certificates to recognise individual roles within INTERMAGNET
EXC.AI-4	ExCon	Draft a collaboration agreement between INTERMAGNET and institutes and follow up with Alan Thompson and David Kerridge for previous examples
EXC.AI-5	GH	Find citation of INTERMAGNET data using an automatic on-line search
EXC.AI-6	SF	Distribute the statement of non compliance* regarding issues caused by the pandemic and Russian aggression in Ukraine
EXC.AI-8	ExCon	Arrange 3 monthly on-line meetings for ExCon and ex-officio members
EXC.AI-9	ExCon	Decide on the date and location for next meetings within 3 months from the end of this meeting.

*Draft INTERMAGNET Statement of Non-compliance with rules for IMOs

Two recent events, the COVID19 pandemic and the Russian invasion of Ukraine have created unprecedented difficulties for the operation of some INTERMAGNET Magnetic Observatories (IMOs)

These events are outside the scope of the situations for which the rules for IMOs were designed and are beyond the control of the institutes operating these observatories. Accordingly, INTERMAGNET has temporarily suspended the requirements for IMOs affected by these two incidents. Consequently, affected observatories will still be considered as IMOs but it will be noted that they are temporarily unable to provide data. We hope that the difficulties facing these observatories will be resolved soon so that their full participation in the global INTERMAGNET community can resume. The decision will be reviewed at the next INTERMAGNET meeting, planned for October 2024.

12 Definitive data subcommittee

12.1 Meeting overview

The DD subcommittee met on Sunday May 28 and Monday May 29 via a hybrid meeting to progress aspects of our activity.

12.2 Participants and mentions

Achim Morschhauser (AM), Andrew Lewis (AL), Benoit Heumez (BH), Charles Blais (CB), Chris Turbitt (CT), Jan Reda (JRD), Jürgen Matzka (JM), Roman Leonhardt (RL), Sergey Khomutov (SK), Simon Flower (SF), Tero Raita (TR), Virginie Maury (VM), Shun Imajo (SI), Susan Macmillan (SM)

12.3 Agenda

1. A review of progress on Actions Items from the previous meeting (Internet online Sep 2021).
2. Reports on the 1-min and 1-sec Definitive Data collection.
3. Issue of absolute measurements during the pandemic.*
4. The problem of acceptance or lack of acceptance of definitive data from previous years.*
5. IMOs of concern and awaiting checking. *
6. Issues related to cross-checking in the context of the war in Ukraine. *
7. Completion of work related to the IYFV format change.
8. Issue of publishing Definitive 1sec on the INTERMAGNET web and as DOI. †
9. Issue of IAF data availability and Definitive Data Statistics generated by GFZ in the context of data migration from Ottawa to Edinburgh. †
10. Is it still necessary to publish country-maps in DOI publications?
11. Acceptation baselines obtained from automatic absolute measurement systems.
12. Issues of certificates or other official letters after definitive data acceptance.
13. Dependencies between publishing real-time data and final data on the web.
14. Other Matters for Discussion.
15. DD Subcommittee Action Items following Sopron 2023 Meeting.

* joint meeting with the IMO Subcommittee

† joint meeting with the GWD Subcommittee

12.4 Review of actions items from 2021 September online meeting

Number	Responsible	Description	Status Green completed, Orange ongoing; Red not started
DD.1	JRD	Sending CALL FOR ONE-MINUTE DEFINITIVE DATA FOR 2021 by end of January 2022. Deadline for data submission is July 1st, 2022	Done, Also sent call for 1-min definitive for 2022
DD.2	JRD	Sending CALL FOR ONE-SECOND DEFINITIVE DATA FOR 2020 – February 2022. Deadline for data submission is October 1st, 2022.	Done - completed by RL RL also sent call for 1-min definitive for 2021

DD.3	JRD	Completion IRDS2018 and cooperation with GFZ to publish as DOI	Done
DD.4	JRD	Continue compilation IRDS2019 and publication if possible	Done Started compilation IRDS2020
DD.5	BH	Prepare a letter to IMOs and parent institutes regarding DOI publications (2016, 2017) with formal acknowledgment of their contribution.	2016 – done 2017 – prepared but not sent
DD.6	CB	Put a notice on the INTERMAGNET web site regarding DOI publications	Done (https://intermagnet.github.io/data_conditions.html)
DD.7	BH, TR, RL, SK, AL	Continuing work on the guide how to check INTERMAGNET 1-minute definitive data and Developing a 1-min checklist for data checkers and IMOs	Ongoing
DD.8	AL, AM, BH, JRD, SK, SM	Continuing work on IYFV issues	Work in progress
DD.9	RL	Continuing work on IMBOT - the automatic data checker for 1-sec and 1-min submissions to INTERMAGNET	Done
DD.10	RL	Creating a pilot list of 1-sec definitive data sets qualified for publication on INTERMAGNET web	In progress- (8 annual data sets accepted for web)
DD.11	TR	IMO statistics of reporting G-values	Ongoing
DD.12	SK	Information to IMOs with remarks on determining of adopted base values	SK resigned from his work for INTERMAGNET
DD.13	AL, JRD	Send an email to all members of the data checking task team to get their views about contributing to the 1-sec manual data checking	There was no email sent, but instead RL organized the online meeting Jan 16, 2023 for interested persons.

12.5 Presentations relating to DD Subcommittee

During the meeting members of DD Subcommittee provided the following presentations and documents:

- “Report on 1 minute and 1 second definitive data collection”, presenter Jan Reda,
- “Progress on one-second data”, presenter Jan Reda.

12.6 Reports on 1-minute and 1-second definitive data collection

Detailed reports on the status of 1-minute and 1-second definitive data were presented in plenary (see sections for details and a link to the presentation.)

12.7 Issue of absolute measurements during the pandemic

This agenda item took place at a joint meeting with the IMO subcommittee.

During the pandemic, many observers performed significantly fewer absolute measurements than usual. We did not take any special position on this matter, as it is a temporary and exceptional problem.

12.8 Definitive data and IMOs of concern.

Parts of this section have been removed from this public copy of the minutes as it contained discussion about individuals, observatories or institutes.

Agenda items 4 and 5 took place at a joint meeting with the IMO subcommittee

The specifics of the discussions and conclusions can be found in the IMO report in sections 14 and 16.

12.9 Data checking in the context of the war in Ukraine

Parts of this section have been removed from this public copy of the minutes as it contained discussion about individuals, observatories or institutes.

Agenda item 6 took place at a joint meeting with the IMO subcommittee.

The Russian aggression against Ukraine has unfortunately also affected the INTERMAGNET routine works. In particular, this concerns cross-checking cooperation developed by INTERMAGNET. Annual definitive data sets provided by IMOs are checked by members of Data Checking Task Team and DD committee members in a 2 stage process. Definitive data are checked by colleagues from other observatories, usually from foreign observatories. In connection with the war in Ukraine some problems arose:

In March 2022, ExCon prepared a text that can be sent to Russian IMOs in situations where there is a pause in cross-checking of definitive data for Russian observatories. This text has been used several times in correspondence with Russian observers related to cross-checking.

12.10 Completion of work related to the IYFV format change.

Work on modifying the IYFV format is close to completion. However, there remains a decision to make on whether to stop publishing annual averages calculated from the 5 most disturbed days every month. According to the information we have, there is no demand for disturbed day annual mean, however, the issue of changing the IYFV format to remove disturbed day means must be made in consultation with IAGA. (Action Item DD.4)

12.11 Definitive 1 sec data on the web and as DOI.

Agenda item 8 took place at a joint meeting with the GWD subcommittee.

There are significant differences in the collection and publication of one-minute and one-second definitive data. These differences are presented in the table in section 7.3 (Plenary presentation) The current situation is that one-second definitive data is not yet published on the INTERMAGNET web page or as a DOI. A working group will be set up to address the issue of publication on the web and subsequently, as a DOI. **(DD.6 Item Action)**

12.12 GFZ Summary statistics following archive migration to Edinburgh.

After the migration of the INTERMAGNET web from Ottawa to Edinburgh, there are still issues related to definitive data that need to be resolved. For example, the statistics generated by GFZ regarding the progress of collecting definitive minute data on step1, step2 and step3 INTERMAGNET web is now broken because access to <ftp://ftp.seismo.nrcan.gc.ca/intermagnet/minute/definitive> has stopped working. These statistics were sent at the beginning of each month to IMOs. They were helpful for the

IMOs, the Data Checking Task Team and INTERMAGNET officers. This issue is waiting for a solution. (DD.11 Item Action)

12.13 Country maps in DOI publications

Preparing country maps with the location of IMOs of given country is time-consuming. Such maps do not add much to the publication of geomagnetic data. An IMOs location map is included on the DOI landing page. Removing the need to include country maps with the DOI did not raise any doubts during the discussion at the meeting.

12.14 Baselines from automatic absolute measurement

There are already observatories that use AutoDIF magnetometers for automatic measurements of declination and inclination to control baseline (CNB, WIC). The AutoDIF measurements are verified using manual measurements. Automatic absolute measurements are expected to become more common in the INTERMAGNET network and there will be a need to update the IBFV format (INTERMAGNET baseline format) to differentiate between the two types of observations.

When working on a new version of baseline format, the following should be considered:

- at least 6000 absolute measurements during the year
- the ability to mark whether the measurement is performed automatically or manually
- the BLV file should include information about the format version
- time resolution of adopted base values should be more frequent than daily

(DD.10 Item Action)

12.15 Acknowledgments for definitive data acceptance

Official confirmation of the publication of one-minute definitive data were sent when CD/DVD/USB were published or, more recently, after minting the DOI. It would be desirable to provide official confirmation to the IMO or parent institute earlier, for example immediately upon publication of the data on the INTERMAGNET web. These confirmations could be generated automatically after the data is accepted by the Data Checking Task Team and Definitive Data Subcommittee. It may be appropriate for these confirmations to be signed by ExCon or OpsCom. A template for such confirmation was presented by BH. It is planned that a proposal including software supporting this idea will be prepared for the next INTERMAGNET meeting. (DD.8 Item Action)

12.16 Dependencies between real-time and final data on the web.

There was not enough time to discuss this issue.

12.17 Other Matters for Discussion.

Due to lack of time no additional issues were added to the meeting agenda.

12.18 Action Items from Sopron 2023 meeting

Parts of this section have been removed from this public copy of the minutes as it contained discussion about individuals, observatories or institutes.

No	Responsible	Description	Notes
DD.1	JRD	Sending CALL FOR ONE-MINUTE DEFINITIVE DATA FOR 2023 by end of January 2024.	

DD.2	RL	Sending CALL FOR ONE-SECOND DEFINITIVE DATA FOR 2022 by the end of February 2024	
DD.3	JRD	Compilation IRDS2020 and cooperation with GFZ to publish as DOI	
DD.4	AL, SI, JRD	Continuation of work on the IYFV annual mean data format, especially contact with IAGA regarding Disturbed annual means.	
DD.5	RL	Continuing work on IMBOT	
DD.6	JRD, SF	Establish working group concerning the publication 1sec definitive data (on INTERMAGNET web and as DOI)	
DD.7	BH	Prepare a letter to IMOs and parent institutes regarding DOI publications 2017, 2018, 2019 and if possible 2020. Sending letters to IMOs.	
DD.8	RL, BH	Development of the concept of confirmation of definitive 1min data publication on the INTERMAGNET web (acceptance letter, software).	
DD.10	JM, AL, RL	Development of a new version IBFV base line format to account for manual and automatic measurements	At least 6000 measurements; consider change time resolution; additional column for status; information about format version
DD.11	VM, BH, SMF	Organizing easy access to all the most up-to-date IAF files (since 1991) published on the INTERMAGNET web page (step3)	Especially important for the compilation of IRDS and monthly GFZ Statistics. This matter is a side effect of the Ottawa-Edinburgh migration.

13 GINS/WWW and Data Formats Subcommittee

13.1 Meeting Overview

The GWD subcommittee met on Sunday May 28 and Monday May 29 via a hybrid meeting. Additional material is available as GitHub “issues” topics available at: <https://github.com/INTERMAGNET/wg-www-gins-data-formats/issues>. Specific issues are linked below.

13.2 Participants

Alexandre Gonsette (AG), Andrew Lewis (AL), Benoit Heumez (BH), Brendan Geels (BG), Charles Blais (CB), David Calp (DC) Jan Reda (JRD) Simon Flower (SF) Stephan Bracke (SB) Tero Raita (TR). Virginie Maury (VM), Hiroaki Toh (HT) Manjula Lingala (ML), Marcos V. Siqueira da Silva (MSS)

13.3 Agenda

- Detail of switch of data portal from NRCAN to BGS (this will be discussed in plenary). GINs can turn off data transfer to Canada (if they have not already done so) - **Presentation for information.**
- Real-time data exchange (this will also be discussed in plenary). Previous discussion of this issue is available here: <https://github.com/INTERMAGNET/wg-www-gins-data-formats/issues/6> - **Discussion requiring decision.**
- Tracking issues and encouraging contributions to IT work in INTERMAGNET. The general approach is to use an issue tracker on Gitlab: <https://github.com/INTERMAGNET/wg-www-gins-data-formats/issues>. A specific discussion on this was started here: <https://github.com/INTERMAGNET/wg-www-gins-data-formats/issues/10> - **Discussion**
- A replacement for the INTERMAGNET activity map (gone since transfer of the portal from NRCAN to BGS): <https://github.com/INTERMAGNET/wg-www-gins-data-formats/issues/8> **Discussion hopefully resulting in an offer of work.**
- Future of IAGA2002, is it ImagCDF, is it CovJSON? It’s getting old, doesn’t support well high sampling rate, etc. Some related discussion on this is here: <https://github.com/INTERMAGNET/wg-www-gins-data-formats/issues/7>, <https://github.com/INTERMAGNET/wg-www-gins-data-formats/issues/1> **Discussion.**
- Future of the web site (also being discussed by the technical manual subcommittee) **Discussion resulting in plan of work to update the website.**

13.4 Review of Action Items from previous meetings

Action	Responsible	Description	Work done / status (Green = completed, Orange = ongoing; Red = not started)
Online2020 GWD.A1	SF, CB, JF, VM, HT	GINs to continue investigation on the ability to use Seedlink for real-time data transfer wg-www-gins-data-formats/issues/6	Superseded by actions in this meeting

Online2020 GWD.A2	SF	Complete the setup at BGS to receive data via RSYNC from NRCAN and GINs	Complete
Online2020 GWD.A3	CB	Continue working with BGS to transfer all data from NRCAN archive to BGS archive.	Complete
Online2020 GWD.A4	CB, JF, VM, HT	Change all data transfer to BGS. All GINs will then change (or add a) destination of rsync transfer to BGS	Complete
Online2020 GWD.A5	CB, All	Continue work on INTERMAGNET.github.io to remove all reference to intermagnet.org	Ongoing
Online2020 GWD.A6	CB, SF	NRCAN to advertise the change to data archive on intermagnet.org. NRCAN will create a page that will indicate the new source of data, website, and tools in English only and remove all previous pages.	Complete
Online2020 GWD.A7	CB	Point intermagnet.org to intermagnet.github.io NRCAN to eventually follow up with SSC (central IT service) to change DNS CNAME of intermagnet.github.io so that the domain is still valid	Ongoing
Online2020 GWD.A8	TR, SF	Continue work on new data visualisation tool accessing BGS data archive web service through SGO wg-www-gins-data-formats/issues/8	Not started, but closed as there is no prospect of a new activity map from SGO
Online2020 GWD.A9	SF, JF	Discussion to continue on the future of a web friendly format (JSON) for distributing data Initial proposal of CovJSON needs a few adjustments. wg-www-gins-data-formats/issues/7	Ongoing
Online2020 GWD.A10	CB, GWD	Start a guideline for doing technical notes in markdown on GitHub wg-www-gins-data-formats/issues/2	Ongoing
Online2020 GWD.A12	SF	Correct CDF files for leap second wg-www-gins-data-formats/issues/5 Once INTERMAGNET data is transferred from NRCAN to BGS, BGS will correct CDF files for leap seconds.	Not started
Online2020 GWD.A13	GWD	Add license information to IAGA2002 header and CDF. wg-www-gins-data-formats/issues/1	Not started
Online2020 GWD.A14	GWD	Continue the discussion on flagging geomagnetic data wg-www-gins-data-formats/issues/3	Ongoing

13.5 Real-time data transfer

We discussed what experience of MQTT and Seedlink exists within INTERMAGNET at the GINs and institutes.

- Ottawa GIN: NRCAN make extensive use of Seedlink for Geomagnetism and have strong experience of it.

- Golden GIN: USGS also use Seedlink extensively in the Geomagnetism group, but are starting to investigate MQTT, partly motivated by MQTT already supporting secure connections, whereas for Seedlink this is currently a proposal.
- Kyoto GIN: Does not have experience in either, but happy to investigate.
- Paris GIN: MQTT is used internally at IPGP, but not used at the GIN.
- Edinburgh GIN: Does not have experience in either, but happy to investigate.
- There is also considerable investment of time in MQTT at a number of institutes:
 - RMI Belgium have been using it for many years
 - ZAMG have incorporated it into their data logging software
 - SGO are using it

Because there is significant investment in both technologies across INTERMAGNET, we decided not to close off access to either MQTT or Seedlink at the present time, but that the Edinburgh GIN will investigate implementing receivers for both systems. Initially the investigation will create MQTT and Seedlink receivers that GINs and individual IMO's can use to send their data to the Edinburgh GIN (and hence the INTERMAGNET data portal). An early goal following this investigation will be for one or both of these technologies to replace the rsync transfer currently used to move real-time data between the GINs. However we are also aware of the potential in the future to use either (or both) of these technologies to distribute real-time data directly to users outside of INTERMAGNET, so will keep this goal in mind during the design phase.

Discussions on the implementation of both MQTT and Seedlink have been recorded in Github (<https://github.com/INTERMAGNET/wg-www-gins-data-formats/issues/6>) – further discussion will continue using this GitHub issue.

The following INTERMAGNET officers have been identified as having experience with MQTT: RL, BH, VM, TR, SB.

RL is thought to have started work on documentation for use of MQTT in the Geomagnetic community.

Action GWD.1: RL to make available documentation on implementation of MQTT

Action GWD.2: SF (with help from RL, BH, VM, TR, SB) to design and implement an MQTT receiver for the Edinburgh GIN and report on experience using it to receive INTERMAGNET data.

The following INTERMAGNET officers have been identified as having experience with Seedlink: BG, CB
CB has created a Docker image for distributing Seedlink tools.

Action GWD.3: CB to make available his Seedlink Docker image

Action GWD.4: SF (with help from BG, CB) to design and implement a Seedlink receiver for the Edinburgh GIN and report on experience using it to receive INTERMAGNET data.

13.6 Migration of INTERMAGNET.org domain to GitHub

A number of photos of INTERMAGNET observatories and historic yearbooks from INTERMAGNET observatories are held on NRCan servers. This has held up moving the intermagnet.org domain fully onto GitHub. Progress was made on this during the meeting. CB will continue to progress this work (an action already exists from a previous meeting covering this work).

13.7 Baseline Values (BLV) file format

Observatories using automatic absolute instruments are starting to deliver data to INTERMAGNET. The current BLV file format will require some modifications to support this data. A small group with an understanding of both the geomagnetic issues and the software concerns is needed to look at this. This group will comprise: SF, DC, RL, AL, AG, JM, JRD

Action GWD.5: SF, DC, RL, AL, AG, JM, JRD to recommend changes to the BLV file format to support automatic observation instruments.

13.8 Liaison with the World Data System (WDS)

The MoU between INTERMAGNET and the WDS has lapsed and needs to be renewed.

Action GWD.6: David Boteler (with help from SF) to take on renewal of the WDS MoU.

13.9 Decisions and action items

13.9.1 Decisions

Number	Description
GWD.D1	An investigation into both MQTT and Seedlink for receiving real-time data will be made at the Edinburgh GIN.

13.9.2 Action Items

Number	Responsible	Description
GWD.A1	RL	To make available documentation on implementation of MQTT.
GWD.A2	SF (with help from RL, BH, VM, TR, SB)	To design and implement an MQTT receiver for the Edinburgh GIN and report on experience using it to receive INTERMAGNET data.
GWD.A3	CB	To make available his Seedlink Docker image.
GWD.A4	SF (with help from BG, CB)	To design and implement a Seedlink receiver for the Edinburgh GIN and report on experience using it to receive INTERMAGNET data.
GWD.A5	SF, DC, RL, AL, AG, JM, JRD	To recommend changes to the BLV file format to support automatic observation instruments.
GWD.A6	David Boteler (with help from SF)	To take on renewal of the WDS MoU.

14 IMO Applications and Standards Subcommittee

14.1 Meeting overview

The IMO subcommittee met on Sunday May 28 and Monday May 29 via a hybrid meeting to discuss issues concerning INTERMAGNET magnetic observatories (IMOs), applications and instruments. A detailed report on IMO discussions is presented in the appendix to these minutes.

Subcommittee Members: Chris Turbitt (chair), Benoit Heumez, Andrew Lewis, Jürgen Matzka, Virginie Maury, Tero Raita & Benoît St-Louis

14.2 Participants

Chris Turbitt (chair), Benoit St-Louis, Benoit Heumez, Jürgen Matzka, Tero Raita, Stephan Bracke, Andrew Lewis (on-line)

Guests: László Hegymegi, Alexandre Gonsette, Marcos Vinicius Siqueira da Silva

14.3 Agenda

Parts of this section have been removed from this public copy of the minutes as it contained discussion about individuals, observatories or institutes.

1. IMO action Items from the September 2021 meeting
2. IMO Applications
 - a. IMOs closed or withdrawn since the March 2021 meeting:
 - b. Update on previous applications:
 - c. New and re-applications:
 - d. Prospective IMOs:
3. IMOs of concern
 - a. Resolved IMO issues since last meeting:
 - b. Russian Federation observatories – data checking on hold*:
 - c. Impact of the pandemic on 2020-2022 data*
 - d. IMOs currently listed as non-compliant*:
 - e. Lists of IMOs of concern and IMOs awaiting checking*:
 - f. Status of the discussion document on the IMO one-minute data checking procedure
4. Discussion on the future supply of DI-fluxgate theodolites
5. IMO Subcommittee Action Items following the 2023 May Meeting

*joint meeting with the Definitive Data Subcommittee/plenary

14.4 IMO action Items from the 2021 September online meeting

Number	Responsible	Description	Status Green completed, Orange ongoing; Red not started
IMO.A1	SK, CT	CT to follow up with SK on the results of data checking AIA 2019 data	Deleted AIA 2019 definitive data accepted Oct 2021, 2020

			data accepted Mar 2022, 2021 data accepted Dec 2022
IMO.A6	CT	Ask the DD Subcommittee to encourage IMOs to submit one-second data as quasi-definitive data	Ongoing

14.5 IMO Applications

Parts of this section have been removed from this public copy of the minutes as it contained discussion about individuals, observatories, or institutes.

14.5.1 IMOs closed or withdrawn since the March 2021 meeting

14.5.2 Update on previous applications:

14.5.3 New and re-applications:

14.5.4 Prospective IMOs

BH: IPGP have new observatories running in Cameroon & Senegal.

14.6 IMOs of concern

Parts of this section have been removed from this public copy of the minutes as it contained discussion about individuals, observatories or institutes.

14.6.1 Resolved IMO issues since last meeting

14.6.2 Russian Federation observatories – data checking on hold:

Report from CT:

On the options for handling Russian Federation observatories, CT listed:

- Continue as is: publish any real-time data that is received; allow definitive data to be uploaded but not checked.
- Withdraw IMO status for 7+3 IMOs on the basis that their data aren't being accepted.
- Introduce a new 'suspended' status which means that data are not being checked or published but can be resumed without a new application.

Decision: do not change the treatment of Russian Observatories. Real-time data can still be accepted. Definitive data can be uploaded but will not be checked. No action will be taken to remove IMO status. EC noted that IAGA have asked for clarification on IM's response to the war in Ukraine.

14.6.3 Impact of the pandemic on 2020-2022 data

Discussion held in plenary

CT: three or more observatories have not been able to maintain absolute level during the pandemic.

DB: As a rule, would like to avoid withdrawing status and would like to encourage observatories to return once the situation is resolved. EXCON would like to issue a communication stating that there are

two unprecedented situations (war in Ukraine and the effect of the pandemic) that the INTERMAGNET policies were not designed to accommodate. INTERMAGNET understands that IMOs may not be able to meet the standards for a period, hence INTERMAGNET will suspend our requirements until the situation can be resolved (up to a period of 15 months). This is an action on EXCON.

BH raised the question of alternatives to INTERMAGNET for publication of real-time data for IMOs that don't have absolute control. e.g. IPM is a 'super-variation' station. EC & DB noted that there are many stations across the world from well-calibrated variometer stations to instances where the funding for stations is uncertain as is the data quality. EXCON to consider this further.

14.6.4 IMOs currently listed as non-compliant

Discussion held in plenary

14.6.5 Lists of IMOs of concern and IMOs awaiting checking

Discussion held in plenary

14.6.6 Status of the discussion document on the IMO one-minute data checking procedure

Not discussed

14.7 Discussion on the future supply of DI-fluxgate theodolites

CT: reported on the current issue in the future supply of DI theodolites from Bartington Instruments. Bartington are no longer supplying Zeiss theodolites, only Wilde theodolites, but are finding it difficult to remain competitive. They are still capable of repairing all theodolites but sourcing Zeiss parts can take up to 12 months.

JM: GFZ provide a brokerage service for theodolite repairs in Germany but also problematic sourcing parts. Mingeo can supply DI-theodolites for the foreseeable future.

SB: IRM can supply DI theodolites based on a Chinese non-magnetic theodolite. IRM originally bought a batch of 50 theodolites from BOIF (Beijing Optical Instrument Factory, China) who now have an improved precision instrument (2 sec rather than 6 sec). IRM have 25 remaining of the original order but are considering buying 50 higher precision instruments. IRM has supplied fluxgate-theodolites to USA & Ireland.

Alexandre Gonsette : BOIF staff have visited IRM in Belgium for checking/servicing of instruments.

László Heymegi: Mingeo has spares of most important parts for the Zeiss theodolites, so can do repairs. Everything is made in house but use a third-party geodetic company for servicing/calibration.

14.8 IMO Subcommittee action items and decisions

Parts of this section have been removed from this public copy of the minutes as it contained discussion about individuals, observatories, or institutes.

14.8.1 Decisions

Number	Decision
IMO.D1	Decision: do not change the treatment of Russian Observatories. Real-time data can still be accepted. Definitive data can be uploaded but will not be checked. No action will be taken to remove IMO status.
IMO.D2	INTERMAGNET will suspend data delivery requirements for those observatories affected by both the war in Ukraine and the COVID-19 pandemic until the situation can be resolved (up to a period of 15 months).

14.8.2 Subcommittee action items:

Number	Responsible	Description
IMO.A1	CT	Ask the DD Subcommittee to encourage IMOs to submit one-second data as quasi-definitive data
IMO.A14	CT	Respond to Yuri Sumaruk that the situation in KIV was presented to the INTERMAGNET meeting and was met with support from the meeting

15 Technical Manual Subcommittee

15.1 Meeting overview

The Technical manual subcommittee met on Sunday May 28 and Monday May 29 via a hybrid meeting to discuss the progress and the next steps for the publication of the Technical Manual in Restructured Text format.

15.2 Participants

Benoit St-Louis (chair), Chris Turbitt (deputy), Stephan Bracke, Jürgen Matzka, Andrew Lewis (on-line)

15.3 Agenda

- 1 Review of September 2021 actions items
- 2 Committee membership, chair
- 3 Technical Manual
 - a. DOI
 - b. ReStructuredText version
 - i. Conversion progress
 - ii. Integration with WEB site and domain name
 - iii. Comparison with V-5.0.0
 - iv. How to submit content/corrections
- 4 WEB
 - a. Closure of intermagnet.org
 - b. Links to data format in the Technical Manual
 - c. Other links to/from the web site
 - d. Policy and Technical notes to be published
 - e. FAQ maintenance
- 5 Round table
- 6 Distribution of actions items
- 7 Mid-term video conference?

15.4 Action items from September 2021 meeting

Number	Responsible	Description	Status Green completed; Orange ongoing; Red not started
TM.1	JM	Generate a DOI for Technical Manual V-5.0.0.	Ongoing, DOIs are created but links can't be found. Links to be added to web site.
TM.2	BSL	Publish TM V-5.1.0 once the new collaboration environment is available on GitHub.	Ongoing, 5.1.0 will be the first version on the new collaborative environment.
TM.3	SB	Configure a dedicated environment to INTERMAGNET for the TM on GitHub.	Ongoing, test environment is fully functional and need to be ported to final destination.

TM.4	SB	Configure a dedicated environment to INTERMAGNET for the TM on ReadTheDocs.	Ongoing, test environment is fully functional and need to be ported to final destination.
TM.5	SB	Complete the conversion of the current version of the manual to RST.	Ongoing, almost complete.
TM.6	TM subcommittee	Install the new development tools locally and experiment with them.	Ongoing.
TM.7	CT	Look at TN and FAQs for QD information to be added to the TM	Not started.
TM.8	JM	Description on the use of DOIs for data/metadata publication in INTERMAGNET.	Not started.
TM.9	DD subcommittee	Provide text for the TM on the use of flags as a separate metadata field (ref. DD31) if this is to be adopted in CDF format	Not started.
TM.10	BSL	Modify Technical Manual references to the 90% rule to state that this can be interpreted as either 90% of the values or 90% of the weight of the filter	Ongoing, decision was made to wait for the new collaborative environment.
TM.11	GWD subcommittee	Flagging of data – how to preserve data rather than deleting it using a separate flag data field. Is this only for CDF or also for other formats?	Not started.
TM.12	SB & CB	Configure URL intermagnet.org for GitHub and ReadTheDocs.	Not started.
TM.13	BSL	Page 5 par 2 ... recognized format – could add a pointer to the section in the document that describes that. Section 6.1.1	Ongoing, decision was made to wait for the new collaborative environment.
TM.14	BSL	In Chapter 2 - not clear what the definitions of the data types are – add pointer to definition/relevant text.	Not started, decision was made to wait for the new collaborative environment.
TM.15	JM	Section 2.3.9 – add text describing where the gp ratio is used.	Not started, decision was made to wait for the new collaborative environment.
TM.16	BSL	Page 13 column 1, paragraph 1 – It makes no sense to me to use the examples of means here within a section on one-second data. Replace with filtered values.	Ongoing, decision was made to wait for the new collaborative environment.
TM.17	JM	Data quality: proofread the guide to the process of despiking data.	Ongoing. Add reference in TM.
TM.18	AL	Produce a list of web pages that can be moved to GitHub.	Completed.
TM.19	GWD Subcommittee	Validate the following information: “1-second data: Available to users within 30 seconds” != (6.2.3 page 31) at the end	Not started.

		"IMO may not make more than 1440 uploads per day"	
TM.20	CB	p 47 part on toolkit used to make website will need to disappear when moving to GitHub.	Not started. To be assigned to SB.
TM.21	CT	Incorporate text : INTERMAGNET applicant agrees to Terms & Conditions explicitly. The application document should also be also signed at a legal signatory level for any institute joining INTERMAGNET.	Completed. Note that EXCON removed the requirement for 'legal signatory' at the March 2021 meeting. This has been replaced by 'institute representative'. (Application form V3.3)
TM.22	CT	Appendix A-1: Many of the definitions are specific to either IMFV1.22 or satellite transmission data formats e.g. "time stamp" and "flags". Add general terminology definitions.	Not started, decision was made to wait for the new collaborative environment.
TM.23	DD Subcommittee	Issues related the yearmean files and IYFV1.01 data format including the definition of the "I – incomplete" flag. Do we need a new format version? Information to be provided by the DD subcommittee.	Not started.
TM.24	BSL	Appendix C-1: Change use of deltaF for "G"	Not started, decision was made to wait for the new collaborative environment.
TM.25	JM	Appendix C-1: Orientation of "UVZ" has no definition in Section 6.1.3 Generate a table of the various orientations for the Technical Manual.	Not started. Change AI to generate a table of the various orientations.
TM.26	CT	Appendix C-4: Needs to be updated to reflect this is software supplied on CDs 1991-???? and has been since been superseded by imcdview (as described in Section 6.4.3.4).	Not started.
TM.27	BSL & SB	Finalize the configuration of the appendices.	Completed.
TM.28	BSL	Proofread the generated HTML version of the Technical Manual.	Completed.
TM.29	BSL	Proofread the generated PDF version of the Technical Manual.	Completed.
TM.30	BSL	Organize a video conference in Nov 2021 for the Technical Manual subcommittee.	Not done.

15.5 Committee membership, chair

BSL has announced that he will step down from INTERMAGNET OPSCOM after this meeting. He has proposed Stephan Brake to replace him in the role of Technical Manual chair and Stephan has accepted the proposal. EXCON also accepted the proposal during the last plenary session. Benoit will continue to work closely with Stephan to ease the transition and will stay available to help whenever possible. This will reduce the subcommittee membership to only 4 members. Last year, it was decided that the Technical Manual subcommittee would wait to see how the workload would be with the new collaborative environment before filling the vacant position left by the departure of Hiroaki Toh. With this new departure, the Technical Manual subcommittee is considering recruiting at least one new member.

Benoit has also proposed the addition of David Calp from Canada as an OPSCOM member of INTERMAGNET but not necessarily in the Technical Manual Subcommittee. This was not addressed in the two private plenary sessions due to lack of time.

15.6 Technical Manual

15.6.1 Digital Object Identifier (DOI) for the Technical Manual

JM has been working with Kirsten Elger from GFZ to create DOIs for the Technical Manual V-5.0.0 and for all previous versions. DOIs need to be added to the GitHub INTERMAGNET WEB site **Action Item TM 27 SB & JM**. A new DOI with Stephan Brake as an editor will also need to be created for the coming version V-5.1.0. **Action Item TM 01 JM**.

15.6.2 ReStructuredText version

15.6.2.1 Conversion progress

A few corrections/suggestions identified during the proofread process are being addressed by SB and the manual will be ready for release in RST format on the INTERMAGNET Github environment. Some work is still needed to prepare the environment and should be completed approximately one month after the meeting. An index will not be implemented in the first release on the new platform because the Technical Manual will be searchable. If required, an index can be added later. The members of the Technical Manual subcommittee will install the development tools locally to experiment with them **Action Item TM 06 TM Subcommittee**.

15.6.2.2 Integration with WEB site and domain name

Integration of the Technical Manual with the INTERMAGNET WEB site on GitHub will only be possible once the full web site is moved to the GitHub environment. SB will also work with CB to configure the intermagnet.org URL to the new web site and the development tools on ReadTheDocs. **Action Item TM12 SB & CB**. Intermagnet.org will remain the URL used once redirected to the GitHub environment to stay independent of the hosting platform.

15.6.2.3 Comparison with V-5.0.0

A list of corrections and suggestions have been identified and are being incorporated to the future V-5.1.0 release of the Technical Manual in RestructuredText format. **Action Item TM18 SB**.

15.6.2.4 How to submit content/corrections

Stephan Brake made a short presentation on how to submit changes to the Technical Manual for the INTERMAGNET members during the Subcommittee report session on the last day. Stephan will also distribute an instruction document on “how to” for the INTERMAGNET members and also a document for external submissions. **Action Item TM32 SB.**

15.7 Web

The subcommittee had very little time to discuss the WEB issues during this meeting.

15.7.1 Closure of intermagnet.org

The intermagnet.org will be redirected to the GitHub environment but will be kept to remain independent of the distribution platform. **Action Item TM12 SB & CB.**

15.7.2 Links to data format in the Technical Manual

Links to the data format in the Technical Manual will only be implemented once the Technical Manual is deployed to the GitHub INTERMAGNET WEB site. **Action Item TM31 TM Subcommittee.**

15.7.3 Other links to/from the web site

All links on the GitHub INTERMAGNET WEB site need to be validated and updated. **Action Item TM31 TM Subcommittee.**

15.7.4 Policy and Technical notes to be published

Ongoing updates.

15.7.5 FAQ maintenance

Ongoing updates.

15.8 Round table

No addition to the agenda. The committee expressed their thanks to BSL for his dedicated work as chair of the committee over many years.

15.9 Decisions and Action Items

15.9.1 Decisions

Decision	Description
	No decisions during this meeting

15.9.2 Action Items

Number	Responsible	Description
TM.1	JM	Generate a DOI for the next release in RST format for the Technical Manual V-5.1.0.

TM.2	SB	Publish TM V-5.1.0 once the new collaboration environment is available on GitHub.
TM.3	SB	Configure a dedicated environment to INTERMAGNET for the TM on GitHub.
TM.4	SB	Configure a dedicated environment to INTERMAGNET for the TM on ReadTheDocs.
TM.5	SB	Complete the conversion of the current version of the manual to RST (only 3 pages left).
TM.6	TM subcommittee	Install the new development tools locally and experiment with them.
TM.7	CT	Look at TN and FAQs for QD information to be added to the TM.
TM.8	JM	Description on the use of DOIs for data/metadata publication in INTERMAGNET.
TM.9	DD subcommittee	Provide text for the TM on the use of flags as a separate metadata field (ref. DD31) if this is to be adopted in CDF format.
TM.10	BSL	Modify Technical Manual references to the 90% rule to state that this can be interpreted as either 90% of the values or 90% of the weight of the filter. To be included in V-5.1.0 release.
TM.11	GWD subcommittee	Flagging of data – how to preserve data rather than deleting it using a separate flag data field. Is this only for CDF or also for other formats?
TM.12	SB & CB	Configure URL intermagnet.org for GitHub and ReadTheDocs.
TM.13	BSL	Page 5 par 2 ... recognized format – could add a pointer to the section in the document that describes that. Section 6.1.1. To be included in V-5.1.0 release.
TM.14	BSL	In Chapter 2 - not clear what the definitions of the data types are – add pointer to definition/relevant text.
TM.15	JM	Section 2.3.9 – add text describing where the gp ratio is used. To be included in V-5.1.0 release.
TM.16	BSL	Page 13 column 1, paragraph 1 – It makes no sense to me to use the examples of means here within a section on one-second data. Replace with filtered values. To be included in V-5.1.0 release.
TM.17	JM	Data quality: proofread the guide to the process of despiking data.
TM.18	SB	Incorporate suggestions/corrections from the proofread of the development V-5.0.0 to V-5.1.0 release.
TM.19	GWD Subcommittee	Validate the following information: "1-second data: Available to users within 30 seconds" != (6.2.3 page 31) at the end "IMO may not make more than 1440 uploads per day"
TM.20	SB	Replace the description on p 47 part of toolkit used to create the website with the tool used on the new GitHub environment. Describe the various formats (RST and PDF) and how to propose changes for external contributors etc.
TM.21	BSL	Incorporate changes proposed by JM to include IRDS and replace CD, DVD and USB with IPM where appropriate. To be included in version V-5.1.0.

TM.22	CT	Appendix A-1: Many of the definitions are specific to either IMFV1.22 or satellite transmission data formats e.g. “time stamp” and “flags”. Add general terminology definitions.
TM.23	DD Subcommittee	Issues related the yearmean files and IYFV1.01 data format including the definition of the “I – incomplete” flag. Do we need a new format version? Information to be provided by the DD subcommittee.
TM.24	BSL	Appendix C-1: Change use of deltaF for “G”
TM.25	JM	Appendix C-1: Orientation of “UVZ” has no definition in Section 6.1.3 Generate a table of the various orientations for the Technical Manual.
TM.26	CT	Appendix C-4: Needs to be updated to reflect this is software supplied on CDs 1991-???? and has been since been superseded by imcdview (as described in Section 6.4.3.4). To be include in version V-5.1.0.
TM.27	SB & JM	Add DOI links for all Technical Manual versions on the INTERMAGNET GitHub WEB site.
TM.28	CT	Production of QD-Data; incorporate JM’s proposal from the updated FAQ (June 2020) into the Technical Manual or a combination of the essentials and some references to the FAQ.
TM.29	TM Subcommittee	Add a section on Auto D&I and Auto Baseline.
TM.30	AL	Add conditions of use CC-BY-NC 4.0.
TM.31	TM Subcommittee	Check and update all links on the Technical Manual and GitHub WEB Site (especially for the data formats to point to the TM). To be included in V-5.1.0 release.
TM.32	SB	Distribute an instruction document on “how to submit changes” for the INTERMAGNET members and also a document for external submissions.
TM.33	SB	Organize video conferences as needed for the Technical Manual subcommittee.
TM.34	OPSCOM	Provide decision on new members/org chart. To be included in V-5.1.0 release.

15.10 Schedule next video conference

SB will organize mid-term video conferences as needed. **Action Item TM33 SB.**

16 Appendix

16.1 Meeting Agenda

16.1.1 Sunday 28 May Plenary session

OPSCOM/EXCON private session			
Time	Topic	Duration	Rooms^[1]
Guests please do not attend this part of the meeting			
9:00	What are the major problems we face (lack of people; overload of work; cybersecurity forcing IT changes; communication internally and externally; people's ability to travel, ...)? What changes does Intermagnet need to make to be effective in the future: - Is the current Intermagnet structure appropriate? - Do we need new officers? Is subcommittee membership appropriate? - Need for new OpsCom chair and 2 new subcommittee chairs - Any change in the need for an IDA subcommittee?	45	2.03 FI
Opening Plenary session			
Guests please do not arrive before this point in the meeting			
9:45	Welcome by D Boteler	5	2.03 FI
9:50	Welcome by S Flower (local information)	5	2.03 FI
9:55	Approval and changes of/to main agenda	10	2.03 FI
10:05	Presentation of 4 subcommittee meeting agendas	30	2.03 FI
10:35	Guests present themselves; Guests' posting to subcommittees	10	2.03 FI
10:45	Coffee^[4]	20	
Plenary			
11:05	Review of action items from previous meetings in plenary and by subcommittee	30	2.03 FI
Items for subcommittees^[3]			
11:35	Recent Intermagnet changes: S Flower	10	2.03 FI
11:45	Publication of one second data: J Reda	10	2.03 FI
11:55	†Citation of Intermagnet data: J Reda	10	2.03 FI
12:05	Russian Federation observatories: J Reda, C Turbitt	15	2.03 FI
12:20	Impact of the pandemic on 2020-2022 data: J Reda, C Turbitt	10	2.03 FI
12:30	Lunch^[2]	90	
Plenary			
Items for subcommittees^[3]			
14:00	†Commercial abuse of data from Intermagnet: E Clarke	10	2.03 FI

14:10	Intermagnet and real-time data (separate paper). Please come prepared with technical descriptions of relevant acquisition and distribution systems you already use, or future plans your institute has. What do we think data providers and users are able and prepared to implement?	30	2.03 FI meeting room
14:40	†Proposed changes to Geomagnetism Metadata System (separate paper): S Flower	10	2.03 FI
14:50	Current state of the Intermagnet web site: S Flower	10	2.03 FI
15:00	Coffee^[4]	30	
Subcommittee & Excon sessions			
15:30	- Tech Manual Subcommittee - WWW / Geomagnetic Information Nodes / Data Formats Subcommittee - Executive Council	60	- 2.03 FI - 2.13 FI - 3.14
16:30	- Intermagnet Observatory Applications Subcommittee and Definitive Data Subcommittee joint meeting - Executive Council	60	- 2.03 FI - 3.14
17:30	End of day 1		

† These topics were not discussed during the meeting due to lack of time

INTERMAGNET dinner	
19:00	<i>Deak Restaurant (https://deaksopron.hu)</i>
Note 1:	<i>Large meeting room - seats 28; Small meeting room - seats 13 Egyed Laszlo lecture hall - seats 60 Meeting room facilities: large LED monitors with HDMI connection, notebook for presentation and Zoom, wide angle camera which has overview on the meeting room and wide angle microphone on the table</i>
Note 2:	<i>Lunch arranged in Deak Restaurant (https://deaksopron.hu)</i>
Note 3:	<i>These are items currently affecting INTERMAGNET that need discussion in both plenary and subcommittees.</i>
Note 4:	<i>The institute are kindly supplying coffee for breaks</i>

16.1.2 Monday 29 May Subcommittee and ExCon sessions

OPSCOM/EXCON private session			
Guests please do not attend this part of the meeting			
8:00	Continuing discussions on Intermagnet structure and membership	60	2.03 FI
Subcommittee & Excon sessions			
Guests please do not arrive before this point in the meeting			
9:00	- Intermagnet Observatory Applications Subcommittee - WWW / Geomagnetic Information Nodes / Data Formats Subcommittee - Executive Council	60	- 2.03 FI - 2.13 FI - 3.14
10:00	Coffee^[4]	30	

10:30	- Technical Manual Subcommittee - Definitive Data Subcommittee - Executive Council	60	- 2.03 FI - 2.13 FI - 3.14
Plenary			
11:30	Report on IMO's: C Turbitt	45	2.03 FI
12:15	Report on definitive data timeliness: J Reda	15	2.03 FI
Lunch^[2]			
12:30		90	
Lunch^[2]			
14:00	Reports, decisions and action item lists from subcommittees	45	2.03 FI
14:45	Report, decisions and action item list from EXCON	15	2.03 FI
15:00	Review and agreement on decisions and action items from plenary sessions	20	2.03 FI
15:20	Date and place of next meeting	10	2.03 FI
Coffee^[4]			
15:30			
End of meeting			
15:30			

16.2 IMO Subcommittee Report and discussion on IMOs

This section has been removed from this public copy of the minutes as it contained discussion about individuals, observatories or institutes.