

INTERMAGNET Meeting Minutes

Public Edition

22 – 26 March 2021

On-Line



Participants:

EXCON:

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Gauthier Hulot (GH), IPGP, France
Alan Thomson (AT), BGS, UK
Kristen Lewis (KL) USGS, US

OPSCOM:

Charles Blais (CB), NRCan, Canada
Stephan Bracke (SB), IRM, Belgium
Simon Flower (SF), BGS, UK
Benoît Heumez (BH), IPGP, France
Andrew Lewis (AL) GA, Australia
Roman Leonhardt (RL), ZAMG, Austria
Jürgen Matzka (JM), GFZ, Germany
Virginie Maury (VM), IPGP, France
Achim Morschhauser, GFZ, Germany
Tero Raita, U. Oulu, Sodankylä Obs, Finland
Jan Reda (JRD), IoG PAS, Poland
Benoît St-Louis (BSL), NRCan, Canada
Hiroaki Toh, (HT), KU, Japan
Chris Turbitt (CT), BGS, UK
Sergey Khomutov, (SK), IKIR, Russia

Institute Abbreviations:

BGS – British Geological Survey

GA – Geoscience Australia

GFZ –German Research Centre for Geosciences

IAGA – International Association of Geomagnetism and Aeronomy

IKIR – Institute of Cosmophysical Research and Radio Wave Propagation FEB RAS, Russia

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

NRCan – Natural Resources Canada

SGO - Sodankylä Geophysical Observatory, Finland

USGS – United States Geological Survey

ZAMG - Zentralanstalt für Meteorologie und Geodynamik, Austria

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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. Text shown in *italics* represents comments from participants taken from meeting documents. These comments may have been paraphrased by the secretary.

1 Meeting format

This was an on-line meeting structured primarily as a document meeting with individual sub-committees holding live on-line meetings as required. The dates for the meeting were agreed via an on-line poll. In order to achieve outcomes in the time available all participants were requested to follow the published agenda as closely as possible over the period of the meeting while working in the time-zone best suited to their needs.

Documents for the meeting were hosted by GFZ on their NextCloud productivity platform:

<https://nextcloud.gfz-potsdam.de/s/yLdpcGiaFtFqFm2>

Password:

Additional publicly accessible document discussions were hosted as “issues” within some subcommittee repositories on GitHub. There were also some private document discussions within the IMO subcommittee in the IMO_Applications “team” on GitHub.

<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 and a slack channel were also available throughout the meeting for real-time messaging and general announcements.

opscom_intermagnet@gfz-potsdam.de

excon_intermagnet@gfz-potsdam.de

<https://intermagnetworkspace.slack.com/archives/C01RMAH763S>

Plenary presentations were available on the NextCloud document server as PowerPoint files, many with pre-recorded commentary. The presentations have been transferred to the INTERMAGNET web site; links are available below.

The format of this meeting was not suitable to accommodate guests. While the password protected NextCloud document server is not open to guests it is possible for guests to contribute to public-access GitHub “Issues” discussions.

2 Committee structure and membership

2.1 Executive Council (EXCON)

Alan Thomson*
David Boteler
Gauthier Hulot
Kristen Lewis

2.2 Operations Committee (OPSCOM)

Chair Simon Flower*
 Secretary Andrew Lewis

Subcommittees

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)	Hiroaki Toh (P)	Benoît Huemez (S)	Chris Turbitt^ (P)	Benoît Huemez (S)
Benoît Huemez^ (P)	Jan Reda (P)	Benoît St-Louis (P)	Hiroaki Toh (S)	Benoît St Louis (S)
Charles Blais (P)	Roman Leonhardt (P)	Jürgen Matzka (P)	Jürgen Matzka (P)	Chris Turbitt (S)
Hiroaki Toh (P)	Simon Flower (P)	Sergey Khomutov (P)	Stephan Bracke (S)	Jürgen Matzka (S)
Roman Leonhardt (P)	Stephan Bracke (P)	Tero Raita (S)		Sergey Khomutov (S)
Sergey Khomutov (S)	Virginie Maury (P)	Virginie Maury (S)		
Simon Flower (P)				
Tero Raita (P)				
Virginie Maury (P)				

* Chair of council/committee/subcommittee; ^ Deputy Chair of subcommittee

(P) Primary affiliation; (S) secondary affiliation

2.3 Changes to membership

There were no changes to the membership since the previous meeting and none during this meeting.

3 Agenda, minutes and membership

3.1 Agendas

The main agenda for the meeting is available in the appendix. Sub committee meeting agendas are included in the sub-committee sections below.

3.2 Approval of minutes from on-line meeting July 2020

Minutes from the previous on-line meeting held in July 2020 were published in January 2021. 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 Committee membership

SF identified three areas where additional skills may be required:

- Leadership for checking and publication of 1-second data;
- Integration of the Technical Manual into the GitHub environment, including distribution and contribution for new releases;
- Web application development, web content and style. Can we enlist assistance from people outside INTERMAGNET, or use the skills of INTERMAGNET officers more effectively?

BLS noted that SB has volunteered to investigate options for the Technical Manual and he has been making good progress. He will present results during this meeting.

TR reported that U. Oulu has requested a letter of support from INTERMAGNET for web application visualisation work and noted the first funding has been received.

AL raised the idea of exploring emeritus membership where experienced retired members could contribute to INTERMAGNET.

3.4 Communications

Discussion on communications is a standing item on the agenda and SF asked if we are doing enough to communicate with the INTERMAGNET community. Completing version 5 of the Technical Manual and publishing records of meetings are both significant steps in communications.

AT noted an AGU EOS paper describing recent developments in INTERMAGNET will be published soon with details being finalised now with AGU publishing. The paper will mention we are keen to work with institutes with little or no representation in INTERMAGNET at the present. AT also mentioned the plan to arrange an INTERMAGNET session at the next Observatories workshop and noted increased use of on-line tools and webinars could open options for communications.

4 Progress on plenary actions items

4.1 Action items from July 2020 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	completed
P.A02	chairs	Supply a report on subcommittee activities for inclusion in the "Report to IMOs" by 6 weeks after completion of the meeting	completed

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 late
P.A04	AL	Complete draft minutes, including reports from subcommittees by 12 weeks after completion of the meeting	completed
P.A05	committee members	Review the draft minutes within 14 weeks after meeting	completed
P.A06	AL	Complete corrections and amendments to the minutes with 16 weeks	completed
P.A07	AL/SF	Review minutes for publication within 20 weeks after meeting	completed
P.A08	committee members	Review draft “public” minutes within 22 weeks	completed
P.A09	AL	Upload minutes to INTERMAGNET document archive, publish the “public” minutes on INTERMAGNET web site and notify IMO-Contacts by 24 weeks after completion of the meeting	completed
P.A10	chairs	Arrange an online subcommittee meeting or document meeting before the next face to face meeting	TM met online Oct 28, 2020.
P.A11	SF	Request committee members for recommendations on targeted invitations by 10 weeks before the next meeting	Not done. we are not inviting guests to this meeting
P.A12	AT	Invite IAGA secretary-general (or other suitable representative) to attend next physical meeting	No physical meeting has been scheduled
P.A13	SF	Commence arrangements for the next meeting with the local host by 10 weeks before the next meeting	Not done as we are not holding a face-to-face meeting
P.A14	SF	Finalise the list of attendees and resolve any non-attendance issues 6 weeks before the next meeting	Not done as we are not inviting guests to this meeting
P.A15	SF	Request committee members for agenda items for inclusion at the next meeting and request chairs to create subcommittee agendas	completed
P.A16	SF	Include item on next meeting agenda to seek views on effectiveness of INTERMAGNET’s communication with community	completed
P.A17	SF	Announce INTERMAGNET meetings on worldobs mailing list	Not done as we are not inviting guests to this meeting
P.A19	SF	Publish draft agendas 2 weeks before the next INTERMAGNET meeting	completed

P.A20	GIN Managers -VM, HT, Abe Claycomb(?)	Investigate re-directing rsync data stream from NRCAN to BGS	Waiting for BGS to provide rsync details to GIN managers (SMF)
P.A21	AL	Inform IMO's with non-compliant 2017 QD data	completed
P.A22	AL	Investigate availability of data latency information at GINs	Not started
P.A23	SB	Evaluate options to integrate Technical Manual V5 into git repository	completed
P.A24	BSL	Publish TM version 5.0.0	completed
P.A25	Committee members	Offer suggestions for prospective members for the Data Checking Task Team and committee members with web development skills.	On going

4.2 Outstanding items from previous meetings

Action	Responsible	Description	Status (Green = completed, Orange = ongoing; Red = not started)
P.A18	AT	Arrange an INTERMAGNET discussion session during the next IAGA observatories workshop	Not done. Workshop was postponed. (Mar 21) No change in situation. The 2022 and 2024 meeting venues have however been decided and we can be represented at these.
P.A20	SF	Publish new version of IMCDView and data conversion software onto GitHub	Not started
P.A21	SF	Generate metadata reports and provide via email to IMO's (in WDC call-for-data) asking for correction and feedback	In progress. Work has been done to generate database views for the reports.
P.A24	SF/K.Elger/BH/JRD	Commence preparation on metadata and DOI for 2016 INTERMAGNET Reference Data Set (IRDS-2016) 1991 – 2016	In progress
P.A26	BH/SB/E.Clarke/J.Fee/SF	Prepare a DOI discussion document suggesting best practice and offering advice to IMO's on using DOIs – carried over from Vienna	Not started
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

4.3 Secretary Correspondence

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

Since the 2020 July on-line meeting a small number of emails were received and answered through the secretary_intermagnet@gfz-potsdam.de email address.

5 Presentation in plenary sessions

5.1 Progress on one-second data (JRD)

A report on the situation with one second definitive data collection from 2014 – 2020

https://intermagnet.github.io/meetings/2021Mar-Online/Reda_Progress_on_One_Second_Data.pptx

One second definitive data has been collected since 2014, initially in IAGA-2002 format, but since 2015 data were requested in ImagCDF format. More than 40 IMOs have provided 1-second data and 30 IMOs regularly provide data. All data remain on the Paris FTP server without any public access because, up to now, there is no system of checking and control of data.

The automated checking system developed by RL, “IMBOT” is a promising development. We still need appropriate software for checking and a volunteer to lead the process of checking and publication of data.

RL provided an update on IMBOT progress. The system is running completely automatically for 2018 and 2019 data. For 2018 data: 39 submission; 20 of these have achieved IMBOT level 2 (all files and metadata available and consistent with 1 minute data); 18 IMBOT level 1 (some missing metadata); 1 IMBOT level 0 (IMBOT could not unzip the data files).

For 2019 data: 10 submissions; 6 IMBOT level 2; 3 IMBOT level 1; 1 IMBOT level 0

IMBOT is not yet running for 2020 data

BH provided praise for the IMBOT system and asked if it is possible to extend the system to check one minute data

RL replied it is possible to extend IMBOT to check one minute data. The one minute data are already loaded as part of the 1-second IMBOT data checks but clarification is required on procedures and notifications.

5.2 Report on definitive data (JRD)

A summary of definitive data for 2018-2020 and preparations for IRDS-2016 and IRDS-2017.

https://intermagnet.github.io/meetings/2021Mar-Online/Reda_Report_on_Definitive_Data_Timeliness.pptx

For 2018, 119 IMOs have been submitted with 109 fully accepted. For 2019, 106 IMOs have been submitted and 91 fully accepted. For 2020, 15 IMOs have submitted and 3 fully accepted, noting that it is still four months before the deadline for 2020 data.

Both IRDS2016 and IRDS2017 are both close to finished and now in the review stage. IRDS2016 includes 147 IMOs, IRDS2017 includes 148 IMOs. IRDS2018 has been started and will progress quickly as more 2018 definitive data are accepted.

AL, TR and JM noted further progress in the last few weeks on acceptance and submission of 2018, 2019 and 2020 data from a number of IMOs not mentioned in the presentation.

JR explained the presentation was prepared about two weeks prior to the meeting, so the situation has progressed in that intervening period.

5.3 Next version of the Technical Reference Manual (SB)

A proposal for collaborative integration and publishing the Technical Reference Manual
<https://intermagnet.github.io/meetings/2021Mar-Online/Bracke-Future-Tech-Man.pptx>

Future management of the Technical Manual requires a process for contribution, version control and publication (html and pdf) which is as automated as possible. The process could be similar to that used for the new INTERMAGNET web site on GitHub. Specific requirements for publishing documents (for example generating tables of contents and auto-numbering) means markdown format, as used for the website, is not suitable for complex documents. Reformatting the manual into ReStructuredText (.rst) and using the Sphinx document generation system can provide the required functionality. The manual can be hosted for free on ReadtheDocs as HTML, including a table of contents and search tools. A downloadable pdf version of the manual is also available. ReadtheDocs has hooks into GitHub, which means changes on GitHub can be processed and published automatically. A test site has been set up for evaluation at <https://test-manual.readthedocs.io>

AL asked if there were tools available to convert the manual in restructuredtext format and asked if anyone had thoughts about the ethical advertising incorporated into the readthedocs website.

SB replied that <https://pandoc.org> is one such tool but work is still required to clean and structure the rst files. Advertising can be removed via a small monthly payment. Alternatively, readthedocs is an open source project that could be self-hosted but that requires on-going maintenance and configuration.

AM commented that the proposal is impressive and asks if future developments on the manual would be done in rst format on github or whether work would continue in the traditional way using .doc files which are later translated into .rst for each release.

SB suggested that future upgrades to the manual should be done in .rst on github under the control of the TM committee

BSL commented that INTERMAGNET selected free open source services. This means INTERMAGNET is independent of specific institutes but also means we cannot choose INTERMAGNET specific domain names.

SB noted that readthedocs is on a similar level to GitHub – both have pricing plans but readthedocs is opensource and can be self hosted.

5.4 Progress on IRDS and DOIs (SF)

A progress report on publishing INTERMAGNET data sets
<https://intermagnet.github.io/meetings/2021Mar-Online/Flower-IRDS-And-DOI-Progress.pptx>

INTERMAGNET has created DOIs for definitive data sets since 2013 and in 2015 the idea of the INTERMAGNET Reference Data Sets (IRDS) was introduced whereby all available definitive one minute data are published. 2015 was the last year data were published on physical media.

<https://doi.org/10.5880/INTERMAGNET.2013>

<https://doi.org/10.5880/INTERMAGNET.2014>

Should DOIs also be created for the earlier INTERMAGNET publications (1991 – 2012)? DOIs for the IRDS2016 and IRDS2017 are being prepared and the process of creating DOIs is now well understood and can become a normal process of data publication for INTERMAGNET.

JM, BH, JRD and AT expressed their opinion that it is not necessary to create DOIs for earlier published data.

5.5 Future of the INTERMAGNET data archive and web site (SF)

Progress on transferring the data archive from NRCAN to BGS

https://intermagnet.github.io/meetings/2021Mar_Online/Flower_Archive_Transfer_Progress.pptx

Transferring the INTERMAGNET data archive and associated services from NRCAN to BGS will happen in 2021 and includes; receiving data from the 4 other GINs, replace the data download application, allow ftp access to data and provide usage statistics to users.

Agreement has been reached with BGS IT to host the data, transfer data via rsync from the other GINs and deploy internet applications using existing BGS Kubernetes infrastructure. Software has been developed to receive data via rsync, distribute data, and the BGS ftp server has been updated. A system to create, store and provide data usage statistics has been developed https://imag-data-staging.bgs.ac.uk/GIN_V1/GINStatistics

Work is in progress to deploy both rsync software and the ftp server in the BGS Kubernetes infrastructure and to develop plots of recent geomagnetic activity (in collaboration with U. Oulu/SGO). Implementation of data embargo periods across all GIN software products is also progressing. Liaison between the four other GINs to receive data and with NRCAN to receive the historic data archive is yet to commence.

TR noted that the data visualisation work at U.Oulu/SGO is in progress

5.6 IMBOT an automatic data checker for 1-second data submissions (RL)

An explanation of the INTERMAGNET robot for automatic checking of 1-second definitive data submissions.

https://intermagnet.github.io/meetings/2021Mar_Online/Leonhardt_IMBOT2016.pdf

Since 2014 IMOs have been able to contribute 1-second definitive data. So far 36 IMOS are routinely contributing. There has been no formal quality control or data checking, hence data have not yet been published. The INTERMAGNET robot (IMBOT) has been developed to automatically check data submissions. IMBOT is developed on a transparent evaluation process and should reduce workload for data checkers and reduce the time delay between submission and publication of data.

IMBOT detects new data uploaded to the Paris GIN, unpacks data, checks data and metadata, compares the data to definitive one-minute data, reformats data to ImagCDF format and sends a summary report to data providers and checkers. Common problems identified by IMBOT are incorrect file names, incomplete metadata, corrupt files, incorrect time intervals or data content, deviation from one-minute data and excessive noise level. A level 0 (red) report provided by IMBOT indicates corrupt files or data

problems, level 1 (yellow) usual indicates missing metadata, incomplete files or large delta F values. A level 2 (green) report indicates the data are provisionally accepted and require further inspection by a human data checker.

6 Next meeting

As the situation with international travel is still not sufficiently predictable to plan a face-to-face meeting SF suggested another on-line meeting in September or October 2021 and asked for suggestions to improve the quality of the on-line meetings.

AT agreed that an on-line meeting in at least 6 months time makes sense.

AL noted the next IAGA workshop has been scheduled for Kazan in 2022 and asked if mid-term on-line subcommittee meetings will be required

BSL reported that TM decided not to have a mid-term meeting, but documents will be exchanged as required.

An on-line poll was held soon after this meeting and the date for the next on-line meeting was set for 27 September – 01 October 2021

7 Decisions and action items

7.1 Decisions

Decision	
P.D20.1	The next meeting will be a virtual meeting 27 September – 01 October 2021

7.2 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/AL	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	SF	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	AL	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	AL	Complete corrections and amendments to the minutes with 16 weeks
P.A07	AL/SF	Review minutes for publication within 20 weeks after meeting
P.A08	committee members	Review draft “public” minutes within 22 weeks

P.A09	AL	Upload minutes to INTERMAGNET document archive, publish the “public” minutes on INTERMAGNET web site and notify IMO-Contacts by 24 weeks after completion of the meeting
P.A10	chairs	Arrange an online subcommittee meeting or document meeting before the next face to face meeting
P.A11	SF	Request committee members for agenda items for inclusion at the next meeting and request chairs to create subcommittee agendas
P.A12	SF	Include item on next meeting agenda to seek views on effectiveness of INTERMAGNET’s communication with community
P.A13	SF	Publish draft agendas 2 weeks before the next INTERMAGNET meeting
P.A14	SF	Arrange another online meeting in September 2021
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 INTERMAGNET
P.A16	TR/EXCON	Provide a letter of support to U. Oulu for development of web application visualisation

8 Executive Council

16:00-17:45UTC, 25 March 2021, On-line via Zoom

8.1 Participants

David Boteler, Gauthier Hulot, Krissy Lewis, Alan Thomson

8.2 Agenda

- Progress on action Items
- Discussion potentially leading to decisions
- General discussion & information exchange
- Review of action and decision Items
- Any Other Business

8.3 Progress on EXCON action items

Action	Responsible	Description	Status Green completed, Orange ongoing; Red not started
EXC.AI-1	EXCON	The IMO application form and technical manual (as required) is to be amended to draw applicant's attention to the INTERMAGNET policy on DOIs and data licensing and also to explicitly require applicants to either agree to this policy, or to state the conditions under which their institute's data may be used. (CT, BSL)	Completed
EXC.AI-2	EXCON	Explore issues and ideas around use of social media to boost INTERMAGNET's profile and engagement with younger scientists, perhaps leading to a specific subcommittee on communications. (AT and EXCON)	NOT STARTED * See further explanation below

* We discussed that younger scientist would be best placed to lead this. But how to do this, is the main question? By a special subcommittee? (For example, the lockdown has highlighted the need for good comms when we are unable to mix f2f with each other and with other IMO people, not least as it is important to know what each other does. Similarly, we want to encourage younger scientists to get involved in IM online, to see what we do, even if they can't physically attend a meeting.) **A Decision was made to postpone action on this until we can meet physically again.** But in the meantime, we each (in EXCON and beyond) could maybe ask local young colleagues, or institute social media experts, to consider how they would approach this idea of better engagement and talk about what they suggest to us next time. But we should also be wary of any institute policies on social media use that may restrict what we can actually do through official accounts!

Some wider issues were also sparked by this discussion. We had some ideas around setting up a broader council or platform for all IM members (in the most general sense), where we can report to the wider

community, without interrupting our (sometimes sensitive) committee work. Online also opens up opportunities for better and modern comms online, e.g. webinar, YouTube, which engages different types of audience. Could we therefore put aside a portion (e.g. an open plenary session) of a future IM meeting for others to join in and get an overview of what we do or have done, or to ask questions? **AI: EXCON and SF to discuss options**

8.4 Discussion potentially leading to decisions

8.4.1 Forwarded from TM subcommittee:

TM.1	EXCON	Provide DOI names for the INTERMAGNET technical document series and for the publisher.
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EXCON endorses the idea and asks that OPSCOM itself provide the best way to implement this and any naming convention that is required. AI: OPSCOM. EXCON suggests to implement this in a manner that is consistent with the IRDS method of referencing (again, where this is relevant and appropriate).

8.4.2 Signing of IMO applications by “appropriate person” (a question from IMO committee)

(Action Item EXC.A2 from the Ottawa 2019 minutes states:

“EXC.A2 EXCON; IMO, TM committees Liabilities for data (mis)use and IMO status removal: amendments to application form and technical manual: Amend the IMO application form such that any INTERMAGNET applicant agrees to Terms & Conditions explicitly. The application document should also be signed at a legal signatory level for any institute joining INTERMAGNET. Amend the Technical Manual in line with this, where appropriate and necessary. EXCON members will also seek opinion on INTERMAGNET’s position from their institute’s legal departments to get a broad legal view on INTERMAGNET as an organisation, its responsibilities and liabilities”)

The intention is that the application be signed at an appropriate level only – say at the Head of Department/Institute level, simply by someone with some appropriate level of authority. This means that there is some discretion for the institute on how they are to reply and by whom. There is certainly no need for a legal document (and we are not a legal entity anyway). What we want to achieve with this is a wider recognition of the significance of joining IM within each institute and that the originator is not the only person within the institute who knows that they are, or will be, part of IM.

8.5 General discussion and information exchange

8.5.1 Status of committees and activities

- EXCON
- OPSCOM
 - Progress on definitive 1-minute data
 - Progress on 1-second data
 - Progress on the Technical Manual
 - Progress on DOIs and data licensing

At face value for EXCON, there seems to be probably less activity overall going on, compared to a normal f2f meeting, but things seem to be progressing satisfactorily. EXCON itself can operate nearly as normal, as we have a small group who are in OK time zones. Another observation was that with all the tools (cloud, Git etc) available, it takes some navigation to know where and when the discussion is actually happening. We can't just "drop into a room" and listen.

We noted the interesting development on the 1-sec data checking (Roman's IMBOT). We welcome such developments. It prompted a discussion on wider use of ML-checking of the more mundane activities and reducing the human workload. Is there scope for new ideas and activities here? Is there wider experience to share, e.g. on observatory practise and data processing via ML, amongst our members and how it could be adapted to IM?

EXCON also wondered about the progression to adopt the 1-sec data standard: we would like to hear the thoughts of OPSCOM on this.

8.5.2 Items from EXCON members

- USGS
 - Probably still need to discuss SuperMAG at a F2F meeting. For example, still slow (but some) progress on proper acknowledgement of IM and observatories. Suggest we go through the SuperMAG website again, with Jesper's help at a future meeting. A wider issue is the common citing of data centres rather than the data source (the "library versus book" analogy). Journals are at least starting to move to proper data citing in the medium term. Short-term will probably remain difficult.
- IPGP
 - Nanomagsat update: GH gave an overview of where the mission is. The project is currently working on the technical issues that were seen as weaker during the evaluation. Possible launch is 2025, which is a 2-year delay that will be used to improve the science that will be done. The project will build a collaborative group around the mission and will also carry out end-2-end mission simulations. The mission will improve knowledge of fast geophysical processes, for example in the core and ionosphere. One aim is a low-cost scalable collaborative solution, where in time other satellite missions from other nations, once launched, can join the collaboration and effectively extend the INTERMAGNET concept into space! There may be longer term scope for near real time operations, but that isn't planned initially.
- NRCan
 - Currently looking at revamping the Canadian space weather forecasting system and will likely make changes to operational activities. Currently also using different scenarios to determine data and product needs and it is very apparent just how useful geomagnetic data are. What therefore could be the role for INTERMAGNET in feeding into such activities? For example, by creating an automated detection of SSC or SI as part of a global warning system. Can we therefore go beyond the global activity map with ML techniques? For example, by building a tool kit (e.g. miniSEED etc) that uses real-time IMO data to

increase global awareness of space weather hazard and impact, for others to use? How best to do this though?

- May take advice from other institutes around the world working in similar areas. **AI: DB will write some material for INTERMAGNET to consider and take forward.**
- BGS
 - New Head of Geomagnetism: Ellen Clarke. AT will continue on EXCON in the short term. Ellen is already known to many on OPSCOM and EXCON.
 - Status of the EOS paper: this is near publication – after many internal AGU processes and reviews. Should therefore appear “soon”, which could be a matter of weeks (Update: this has now been published at <https://eos.org/science-updates/modernizing-a-global-magnetic-partnership>)
 - Status of User Survey: Issued this past week and we will discuss this further at the next IM meeting after sending out reminders over the summer to the IMOs. 12 replies received already. The analysis method is TBD but USGS will use some automated tools to provide basic summary statistics, as a minimum analysis. We will also need to decide how we will feedback the results to the community. An abstract to IAGA? New EOS article? The basis of an open plenary decision at next IM meeting? All TBD. A reminder email with a deadline will be issued over the summer. Likely closing the survey by September.
 - Relocation of NRCAN web service and archive continues. NRCAN and BGS have had a meeting to agree the roadmap for this, as it is important that this concludes very soon for NRCAN.

8.5.3 INTERMAGNET future

New opportunities

Nanomagsat: As above

User survey: As above

Communications Issues

Updates on and links to external organisations

e.g. IAGA, IUGG, COSPAR, SuperMAG, OSCAR-WMO, UN-COPUOS, ...

8.6 Review of decisions and action items

8.6.1 Action items

Action	Responsible	Description
EXC.AI-1(2021)	EXCON and SF	discuss options around an online public platform or section of the plenary meeting to engage online with the wider IM community, providing an ‘outside world’ update on activities and inviting questions.

EXC.AI-2 (2021).	DB	develop his space weather application ideas involving IMO data and bring for wider discussion.
EXC.AI-2 (2020)		continued through next year (concerning social media)
TM.1 (2020)		redirected to OPSCOM for discussion and action (concerning DOIs)

8.7 Any other business

OPSCOM requests EXCON to consider the idea of “emeritus” INTERMAGNET officers. There may be some retired INTERMAGNET geomagnetists who have much experience and possibly time available to contribute to various aspects, e.g. intermagnet.github.io/ data checking/ technical manual/data applications. This will be fully considered by EXCON at a later meeting but initial comments were all positive.

Meeting closed 17:45UT 25th March 2021.

9 Definitive data subcommittee

9.1 Participants mentioned in the minutes

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 (SMF), Tero Raita (TR), Virginie Maury (VM)

9.2 Agenda

1. A review of progress on action items from Internet 2020 Meeting 2020.
2. Leading the process of 1-second data checking and publication
3. Automatic control of 1-sec definitive
4. Matters concerning started action items
 - Guidance on how to check 1-min and 1-sec definitive data (DD.A5, DD.A7, DD.A8, DD.1)
 - Remarks on determining of adopted base values
 - Statistics of reporting G-values
 - Rewriting check1min in Java
 - Information to IMOs about comparison Definitive vs. Quasi-Definitive
5. Updating Appendix C3 on IYFV
6. Issues concerning IRDS compilation and the production of the DOIs for 1-minute definitive data
7. Cross-checking of 1-minute definitive issues
8. Other matters for discussion

9.3 Review of actions items

9.3.1 Actions items from 2020 online meeting

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	Status Green completed, Orange ongoing; Red not started
Online DD.A1	JRD	Sending CALL FOR ONE-MINUTE DEFINITIVE DATA FOR 2020 by end of January 2021. Deadline for data submission is July 1st, 2021	Done (2021-02-08)
DD.A2	JRD	Sending CALL FOR ONE-SECOND DEFINITIVE DATA FOR 2019 – February 2021. The deadline for data submission is October 1st, 2021.	Done (2021-03-05)
DD.A3	JRD	Completion of compilations IRDS2017 DOI. Compilation of IRDS2018, if possible IRDS2019	2017 completed 2018 ongoing 2019 not started
DD.A4	JRD, SMF	Adding supplementary files to IRDS2015 DOI publication	Done
DD.A5	BH, TR	Completion advancing writing guidance how to check INTERMAGNET 1-minute definitive data.	Started . Needs further work before being publicised. Comments from Data-

			checkers will be asked after the meeting.
DD.A6	AM	Rewriting check1min in Java	Ongoing , will dedicate time in May.
DD.A7	BH, RL	Developing a 1-min checklist for data checkers and IMO's, distribution of such list to the persons concerned	Ongoing . DD.A5 and DD. A7 should probably be merged (? BH)
DD.A8	RL	Developing a 1-sec checking description and checklist and distribution such materials to the persons concerned	Ongoing ; discussions from last IM meeting have been considered when developing IMBOT → reducing possible checklist by removing most technical issues; further discussion required (and 1min checklist as basis)
DD.A9	AL	Information to IMO's about results of comparison Definitive vs. Quasi-Definitive	Done – Notification sent to non-compliant IMO's 2020-08-31
DD.A10	SK	Information to IMO's with remarks on determining of adopted base values	Ongoing
DD.A11	CB	Preparing country/institute maps for IRDS compilations	Done for IRDS2017
DD.A12	VM, JRD	Preparing information for cite.xml regarding IRDS compilations	Done for IRDS2017
DD.A13	TR	IMO statistics of reporting G-values	On going Started by testing usage of readme.imo and imoYYYY.blv files for searching information. Filenames for 2018-2019 at STEP1 are not homogenous, upper and lowercases in filenames. From 2019 BLV files at STEP1 (75 available) : 47 HDZF, 23 XYZF, 3 DIF, 1 XYZ, 1 HDZ.

9.3.2 Outstanding action items from previous meetings

Action	Responsible	Description	Status Green completed, Orange ongoing; Red not started
DD.1	TR, BH, RL, SK, AL	Preparation of a guide how to prepare, especially how to check, 1-min and 1-sec definitive data	On going The latest version of the checking guide is 0.6 , where implemented Chris's IMO App guide.

			External sheet for checking process in development. See DD.A5 and DD.A7. How to check 1-sec not started.
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9.4 Presentations relating to DD Subcommittee

For the meeting members of DD Subcommittee provided the following presentations:

- “An automatic data checker for 1-second submissions to INTERMAGNET”, Roman Leonhardt
- “Progress on implementation of the INTERMAGNET Reference Data Set (IRDS) and DOIs”, Simon Flower
- “Report on definitive data timeliness”, Jan Reda
- “Progress on one-second data”, Jan Reda

9.5 Overview and discussion topics

The meeting was needed and useful. Progress has been made in some aspects of our activity.

9.5.1 One-second definitive

There was no success in finding volunteers to lead the process of 1-second data checking and publication. However, a great idea presented by RL – automatic analyzing all submitted data from 2014 to now using IMBOT developed by ZAMG. The automatic IMBOT system can test 1-sec definitive data submissions and report the data as “provisionally accepted” if it passes. This can be very useful in the checking process.

BH asked if it was possible to distribute one-second data with a warning once it has been checked by IMBOT.

RL noted that it would be possible to automatically check all one-second data from 2014 but suggested it would be very difficult to set up a control system similar to the one-minute checking due to the large volume of data.

SF proposed discussion on providing automatically checked data (with a caveat) should be considered as a plenary discussion to the wider EXCON/OPSCOM membership. The question of how data would be distributed was also raised, presumably in IMAGCDF format?

RL noted that IMBOT created ImagCDF format files from all one-second data checked, even if data are not provided in ImagCDF format.

JRD noted that it is better to publish automatically checked data than publish no data at all.

AM suggested a link to INTERMAGNET GitHub repositories for software which can read ImagCDF data files.

RL mentioned that he would include DD members on the IMBOT mailing list to receive data checking reports.

JRD will submit 2017-2020 1-second data from BEL, HLP and HRN for checking by IMBOT.

9.5.2 Action items

During the meeting, there has been meaningful progress in preparing guidance regarding one-minute data checking. Besides the guidance document, a draft checklist for one-minute definitive data checking has also been prepared as an excel spreadsheet. Additionally, a draft document has been prepared with

remarks on determining adopted base values. It turns out that Action Item DD.9 (Information to IMOs about results of comparison Definitive vs. Quasi-Definitive) was done by AL even before our online meeting.

TR questioned if metadata in readme files can be trusted, concerning information about the G component, or should the metadata in the IAF bin files be used and noted there are inconsistencies in file names on step1.

BH requested everyone read the draft data checking guidelines and checklist and provide comments and modifications.

SK reported he as a draft of text about adopted baseline values in Russian.

9.5.3 IYFV data format

Considerable work and progress have been made during the online meeting. Although there are still some unresolved issues. Most of the concern related to annual means calculated from incomplete data series.

JRD asked if the new IYFV description was ready for the Technical Manual

AL suggested the meaning of the “I” incomplete flag needs further clarification, perhaps defining three bands of data availability to control the use of “A/Q/D”, “I” and “99999”

BH suggested a scheme using 0 – 9 to represent percentage of data availability

SK suggested the IMO should provide explanation for no data and asked if INTERMAGNET can change the file format as it was originally an IAGA format.

AM recommended that notes should be added in the case of “I” or missing data

9.5.4 “About-screen” and other graphic files for IRDS

9.5.4.1 Country/Institute graphic files

CTYsrn.png - About-screen for each country, this file typically includes logo(s) of an organization(s), responsible persons, addresses.

CTY.png - map for each country

These files formally are country files, but now concern more organisations rather than countries. There are several issues regarding graphic files for IRDS, which are not clear for IMOs or the committee:

- detailed requirements regarding these files (dimensions, resolution, type of graphic file, color-accuracy)
- who is responsible preparing and providing these files?

There is no clear guidance available in the manual or on the INTERMAGNET web. The current practice is as follows: IMOs provide CTYsrn.png files, CTY.png country files are prepared by INTERMAGNET (CB). Usually, before the compilation of definitive data of a given year, we ask IMOs for a final check (or to provide) the country/institute files. Occasionally observatories expect CTYsrn.png files should be prepared by INTERMAGNET. This stems from historical precedent because in the early days of INTERMAGNET the USGS helped some IMOs prepare graphic files. As I mentioned CTY.png files (now maps without country borders) are prepared by CB. AM has also offered his help.

9.5.4.2 Global map

INTERMAGNET world maps for IRDS/DOI will not be prepared in the future, because the DOI landing page presents a global location map for all IMOs based on metadata information included in XML file.

9.5.4.3 Complete the works regarding IRDS/DOI 2016 2017

2016 (status in review)

<https://dataservices.gfz-potsdam.de/panmetaworks/review/26aa33314a602e7d3c6e8564d5a97d97066d5d049f098fc6ca16a9a11e1fab23-intermagnet/>

2017 (status in review)

<https://dataservices.gfz-potsdam.de/panmetaworks/review/5a7af4f83534d9809a43da4cf90a1b63d2b58455b522f9e93c393b940c1bb6cf-intermagnet/>

IRDS2016

- "This is the 24th annual publication in the series. " - should be 26th or remove this sentence
- README/IRDS2016 includes among others "This annual publication **is the first** in the "INTERMAGNET Reference Data Set" (IRDS), which will again comprise all data from previous years". On the other hand, IRDS2015 was the first that comprised all data from previous years.
- README/IRDS2016 includes "The latest version of the viewer for this data, IMCDView, is available for all from <ftp://ftp.nmh.ac.uk/INTERMAGNET/software/CDViewer/>". For reasons of consistency with <https://doi> this URL should be <https://intermagnet.github.io/software.html>
- We don't need ERRATA file, only the change_log file is required.

IRDS2017

- "This is the 24th annual publication in the series" - should be 27th or remove this sentence.
- The README file need updating
- The change log should include updated information from IRDS2016 change_log.

All IRDS

These IRDS publications concern **one-minute** definitive data. However, in the Abstracts we can read:

"For more information on the data formats used in this publication ... please refer to Technical note TN6 "INTERMAGNET Definitive **One-second** Data Standard".

This could be confusing - maybe a more adequate reference is Technical Manual?

9.5.5 Cross-checking of 1-minute definitive data

The specific issues concerning cross-checking were discussed with CT from IMO Application Subcommittee.

AL has presented a report on cross-checking: BRD EBR FUR JCO KHB MAB NGK PIL PST SUA (TRW) VAL VSS observatories in the period July 2020 – March 2021

The general comments on data checking of Andrew are the following:

- The majority of the observatories I check provide carefully prepared, high quality data.
- The small number of IMOs with difficult data require the most effort
- Direct communications between data checker and data provider is very valuable.
- Following up on late data or slow replies is an effective way to encourage data submissions.

9.5.6 Other matters for discussion

JRD noted input from DD is required for some the TM action items, including TM9 (data flagging), TM18 (structure of data USB) and TM23 (IYVF yearmean file)

RL volunteered to prepare a draft document on data flagging.

9.6 Decisions and action items

9.6.1 Action Items

Action	Responsible	Description
DD.A1	JRD	Compilation IRDS2018, IRDS2019 if possible
DD.A2	BH, TR, RL	Continuing work on the guide how to check INTERMAGNET 1-minute definitive data and Developing a 1-min checklist for data checkers and IMOs
DD.A3	AM	Rewriting check1min in Java
DD.A4	RL	Continuing work on IMBOT - the automatic data checker for 1-second submissions to INTERMAGNET
DD.A5	SK	Information to IMOs with remarks on determining of adopted base values
DD.A6	AL, AM, BH, JRD, SK, Susan Macmillan	Continuing work on IYFV issues, especially concerning “I” incomplete flag
DD.A7	TR	IMO statistics of reporting G-values

10 GINS/WWW and Data Formats Subcommittee

We encourage the committee members, IMO members and community to visit our Github exchanges at: <https://github.com/INTERMAGNET/wg-www-gins-data-formats/issues>

10.1 Discussion Topics

- [Proposed workflow for INTERMAGNET WWW/Gins/Data Format Working Group discussions.](#)
- [Data transfer upgrade from RSYNC](#)
- [A Coverage JSON format for INTERMAGNET](#)
- [Steps for deprecation of the intermagnet.org website to intermagnet.github.io](#)
- [How to encourage/support change in the community](#)
- [CDF leap second correction](#)
- [Correcting non-IMO and former-IMO on the FTP](#)
- [Metadata information at BGS](#)
- [Licensing of our publications](#)
- [Flagging geomagnetic data and how to include that into data formats](#)
- [Track data license with IAGA-2002 and ImagCDF formats.](#)

10.2 Review of Action Items from previous meetings

The full path to all links is preceded by <https://github.com/INTERMAGNET/>

Action	Responsible	Description	Status Green completed, Orange ongoing; Red not started
Online2020 GWD.A1	SF, CB, JF, VM, HT	GINs to investigate the ability to use SeedLink for real-time data transfer. Update at meeting March 2021: <ul style="list-style-type: none"> • CB to provide examples of SeedLink implementation at the GIN and BGS (archive) for data transfer. 	On going /wg-www-gins-data-formats/issues/6 It has been recognized that changing new transmissions methods will be challenging due, but not limited to, the following: <ul style="list-style-type: none"> - Support on the GIN institute to incorporate any methods proposed - Compatibility of protocol with geomagnetic data with minimal development effort - Cost (if any) Update at meeting March 2021: Agreement to look at SeedLink with examples.
Online2020 GWD.A2	SF	Complete the setup at BGS to receive data via RSYNC	On going - As part of the stop of INTERMAGNET in NRCAN, BGS is to complete all development work to receive data from NRCAN and all GINS. Update at meeting March 2021: Work is continuing at BGS with a presentation of potential web applications for downloading and plotting data.
Online2020 GWD.A3	CB	Assist in transferring all data from NRCAN archive to BGS archive	On going Once previous action is complete, NRCAN can start sending all historical data to BGS. Waiting on GWD.A2
Online2020 GWD.A4	CB, JF, VM, HT	Change all data transfer to BGS.	On going All GINs will then change (or add a) destination of rsync transfer to BGS.

			Waiting on GWD.A2
Online2020 GWD.A7	CB	Point intermagnet.org to intermagnet.github.io	On going 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 Waiting on GWD.A2
Online2020 GWD.A8	TR, SF	Start work on a new map tool through SGO	On going /wg-www-gins-data-formats/issues/8 Update at meeting March 2021: Preliminary web service was presented as part of GWD.A2 but still waiting on it before continuing work
Online2020 GWD.A9	SF, JF	Continue discussion on CovJSON which could be used for a web service	On going /wg-www-gins-data-formats/issues/7 Initial proposal of SF of CovJSON is great but needed a few adjustments. Discussion to continue on the future of a web friendly format (JSON) for distributing data. This could then be used to design dynamic web applications and hosted on GitHub.
Online2020 GWD.A10	CB, GWD	Start a guideline for doing technical notes in markdown on GitHub	On going /wg-www-gins-data-formats/issues/2 Online meeting using GitHub proved efficient and GWD will provide guidelines of technical note formats and contribution. Update at meeting March 2021: Proposal sent to all to start using GitHub for all public discussions with guidelines proposed in link.
Online2020 GWD.A12	SF	Correct CDF files for leap second	On going – /wg-www-gins-data-formats/issues/5 Update at meeting March 2021: Work still on-going with SF
Online2020 GWD.A13	GWD	Add license information to IAGA2002 header and CDF	On going /wg-www-gins-data-formats/issues/1 We know how to add licensing information, but we are putting the discussion on hold until urgent matters settle. In the interim, an action item on all to visit the ticket and provide additional remarks if they wish. Update at meeting March 2021: Since BGS will be hosting INTERMAGNET data, data metadata information is stored separately from magnetic data. Item is on-hold until migration is complete (GWD.A2) to see if metadata license can be stored.
Online2020 GWD.A14	GWD	Continue the discussion on flagging geomagnetic data	On going /wg-www-gins-data-formats/issues/3 RL as started a great discussion on flagging geomagnetic data. Due to the upcoming changes in INTERMAGNET.

			Update at meeting March 2021: None
Ottawa GWD.A1	CB, VM	Clean up the FTP and make sure that non-IMO observatories are no longer contributing data to INTERMAGNET /wg-www-gins-data-formats/issues/4	completed

10.3 Summary of discussion topics

10.3.1 Proposed Workflow for INTERMAGNET

<https://github.com/INTERMAGNET/wg-www-gins-data-formats/issues/2>

Over the past 2 years, the WWW/GINS/Data Formats committee has been using Github to track action items and general discussions. This year, other committees have attempted the same methodology. We have determined that this an effective method of communication and tracking and are suggesting the following workflow for current and future INTERMAGNET operations.

1. Create issue in Github project of the committee (ex: <https://github.com/INTERMAGNET/wg-www-gins-data-formats/issues>) or any committee member puts a ticket on behalf of someone from the public. However, preference given to first option for easier tracking and contribution by the user. If the issue/item is of a private matter, it is placed in a private repository where committee members are given access.
2. Discussion takes place by adding issue comments. Anyone with a github account can comment on issues and anyone given access to the private repository can comment on private issues.
3. Document the result of the discussion in a document **in the project**. If consensus has emerged, changes to content within this repository should be submitted as a pull request. This may be in the form of documentation of the decision (preferably markdown for easier updates). Alternatively, this may result in other changes to content in the repository. The pull request description should reference the discussion issue (e.g. Fixes #XYZ), and after that has been merged the issue can be closed.
4. If changes are required in other projects, or discussion results in multiple new issues for further discussion, create issues referencing the discussion or reference additional documentation before closing this issue.
5. If it is decided to abandon the issue, a comment should be made describing the reason before it is closed.

CB suggested this proposed work flow be considered for adoption by all subcommittees as a plenary discussion item.

SF is happy to use GitHub as a medium for communications within INTERMAGNET. He noted that using GitHub issues has worked well for the last two meetings. GitHub would become a parallel work flow alongside Discussion Documents and Technical Notes and suggested it would be useful to set up a link between the INTERMAGNET document archive (<http://geomag.bgs.ac.uk/intermagnet>) and GitHub issues as a helpful reminder of the two streams of information.

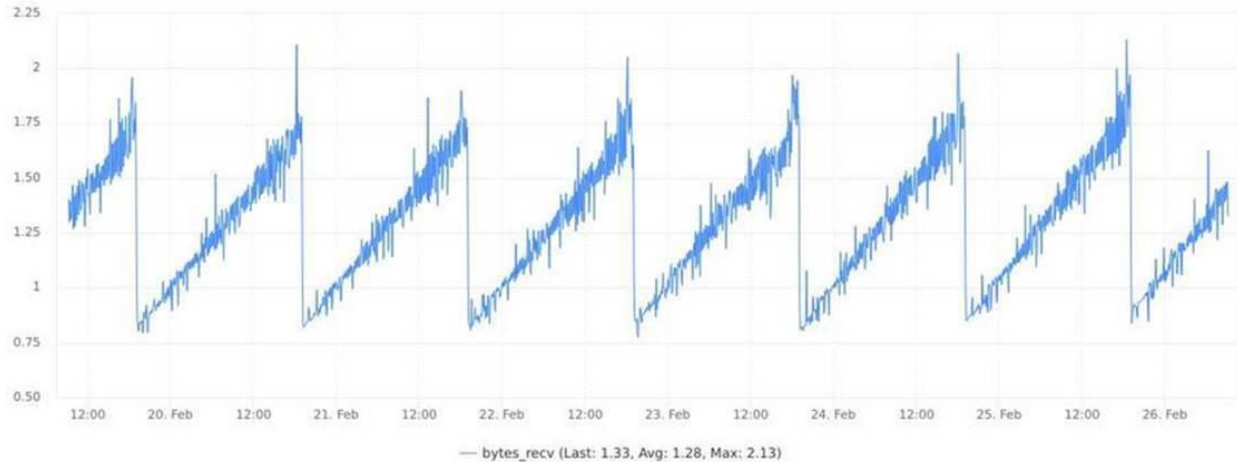
VM agreed and noted it is easy to follow discussion on GitHub than either NextCloud or via email.

10.3.2 Data transfer upgrade from RSYNC

<https://github.com/INTERMAGNET/wg-www-gins-data-formats/issues/6>

A high priority item during the meeting for all GINs is to see if their institutes are willing to supporting new data transfer methods and bring the following item to a path forward.

RSYNC transfer is an out-dated method and not meant for real-time data transfer. For example, isolating RSYNC bandwidth use, following bandwidth usage trend can be noticed:



RSYNC is a difference check; the daily IAGA2002 file gets bigger throughout the day resulting in more bandwidth.

Exchange is still ongoing between two possible candidates, which are seedLink, and MQTT.

SF recapped the discussions and note the two favoured transport protocols are MQTT and seedlink with seedlink seeming to be the favoured protocol. Data duplication will not be problem at BGS as data are stored in a flat file database.

CB noted there are several missing components from a MQTT system including: a standard message format; transmission client; selection of the message broker; client program for storage at BGS. A simple setup for seedlink could be a ring server at BGS; a client to convert data to miniseed format; a client to send miniseed data; a client at BGS to store data.

SB notes the selection and maintenance of the MQTT message broker is important. MQTT offers broad solutions in all programming languages and could even transport miniseed packets. He uses it to transport small binary packets of one-second data.

SF noted that the model will initially be transferring data between GINs rather than from remote, low bandwidth installation with possibly lossy communications.

RL noted that he used MQTT for data transport at WIC for real-time transmission of raw data

VM suggested that data duplication may be a problem for the GINs

HT said the Kyoto GIN will try to implement whatever protocol is decided upon but noted it will cost to implement any changes and asked if the new methods is secure and sustainable.

SB asked how seedlink is a security improvement on rsync.

VM noted ftp is used extensively at PAR-GIN and ftp is known to have poor security.

CB explained that seedlink does not have encryption but can be routed via a VPN tunnel. Access control can be done via IP white listing and firewalls. CB also commented that as seedlink is used widely by the seismic community there is scope for geomagnetism to tap into those resources. FTP transfers could be converted to https via wget with directory listing.

10.3.3 A Coverage JSON format for INTERMAGNET

<https://github.com/INTERMAGNET/wg-www-gins-data-formats/issues/7>

BGS recently published a beta web application for data distribution as eventual successor to the current INTERMAGNET plot/download (https://imag-data-staging.bgs.ac.uk/GIN_V1/). The tool provides CovJSON as an output, which is a standard JSON schema. Some initial analysis and discussion are ongoing. We recommend the community to look at it. This type of format could open up several interesting web application developments.

CB asked specific questions about some CovJSON files downloaded from BGS including: differentiating between F and S data; support for more than one language; should altitude be 0 for all stations. SF explained F and S is important to differentiate total field data from different instruments; only support for one language; may be some errors in metadata

10.3.4 Steps for deprecation of the intermagnet.org website to intermagnet.github.io

<https://github.com/INTERMAGNET/wg-www-gins-data-formats/issues/8>

BGS is still undergoing several developments in preparation for GIN data transfer from Ottawa. Some initial applications have been distributed to the committee members for beta testing. More progress to happen within the coming months before a full move to intermagnet.github.io and move to BGS as the main source of approved INTERMAGNET data.

There were no additional discussions during this meeting

10.3.5 How to encourage/support change in the community

<https://github.com/INTERMAGNET/wg-www-gins-data-formats/issues/10>

Some initial exchange between a few members regarding support to the community. We encourage all members to participate in the exchange.

AL commented that the slow rate of change within the community is likely due to resourcing rather than resistance and suggested one way to encourage change is for those institutes with capability to implement agreed change to lead by example to others.

SF agreed and cited the example of ImagCDF which has been slow to catch on.

10.3.6 CDF leap second correction

<https://github.com/INTERMAGNET/wg-www-gins-data-formats/issues/5>

The ImagCDF format can correctly handle leap seconds via the data type “CDF_TIME_TT2000” but requires access to the most recent version of the leap second information in the form of a text file. This file must be updated after every new leap second and if ImagCDF data files are created using out-dated leap second information the timestamps can contain steps.

SB noted that this issue has been resolved in the MagPY software but not yet resolved on the ftp site.

SF said the issues should remain open as more work is required on the Edinburgh GIN software.

10.3.7 Correction non-IMO and former -IMO on the ftp server

<https://github.com/INTERMAGNET/wg-www-gins-data-formats/issues/4>

There are data from non IMO and former IMOs still available on the ftp data archive – these should be tidied up.

CT listed AMS, CST, DMC and DRV as designated former IMOs, but data from AMC and DMC are still being received.

VM stopped data transmissions from the Paris GIN

10.3.8 Metadata information at BGS

<https://github.com/INTERMAGNET/wg-www-gins-data-formats/issues/11>

Metadata comments in IAGA-2002 data files inserted by IMOs are eventually lost from the files when downloaded from the INTERMAGNET data archive by end users. Can these comments be preserved for access by data users?

SF explained that the Edinburgh GIN stores data in a data base, not as files. This has numerous advantages but also the disadvantage of not storing the metadata from original files provided by the IMOs.

CB says the Ottawa GIN does not alter any data products, but nor does it generate dynamic data products. Finding a flexible storage format that allows both retention of all data and metadata but also allows easy generation of dynamic data products is not easy and requires careful consideration.

10.3.9 Licensing our publications

<https://github.com/INTERMAGNET/wg-www-gins-data-formats/issues/9>

BGS wanted to use images from the 2014 DVD but were unable to as there is no licence information. Should INTERMAGNET licence the non-data components of INTERMAGNET publications, such as images from DVD compilation, or else explicitly include these non data components in the licence we use for data? What is the status of licences given INTERMAGNET is not a legal entity? Do we need an institute to host publications? Can INTERMAGNET, as a non-legal entity, even set out licence conditions?

JRD suggested it may be necessary to set up a consortium of geomagnetic observatory operators with one organisation as the external representative.

10.3.10 Flagging geomagnetic data and how to include that into data formats

<https://github.com/INTERMAGNET/wg-www-gins-data-formats/issues/3>

Rather than removing data it is proposed that data should be flagged so decisions on data quality are transparent.

There were no additional discussions during this meeting

10.3.11 Tracking data licences with IAGA-2002 and ImagCDF formats

<https://github.com/INTERMAGNET/wg-www-gins-data-formats/issues/1>

A discussion on included optional licensing information in the metadata of IAGA-2002 and ImagCDF data files

There were no additional comments on this topic during this meeting

10.4 Decisions and action items

10.4.1 Action Items

“on-going” and “not-yet-started” action items from section 10.2.

Action	Responsible	Description
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
Online2020 GWD.A2	SF	Complete the setup at BGS to receive data via RSYNC from NRCAN and GINs
Online2020 GWD.A3	CB	Continue working with BGS to transfer all data from NRCAN archive to BGS archive.
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
Online2020 GWD.A5	CB, All	Continue work on intermagnet.github.io to remove all reference to intermagnet.org
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.
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
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
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
Online2020 GWD.A10	CB, GWD	Start a guideline for doing technical notes in markdown on GitHub wg-www-gins-data-formats/issues/2
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.
Online2020 GWD.A13	GWD	Add license information to IAGA2002 header and CDF. wg-www-gins-data-formats/issues/1
Online2020 GWD.A14	GWD	Continue the discussion on flagging geomagnetic data wg-www-gins-data-formats/issues/3

11 IMO Applications and Standards Subcommittee

11.1 Participants

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

11.2 IMO Subcommittee agenda, 2021

1. IMO action Items from the 2020 meeting
2. IMO Applications
 - a. IMOs closed or withdrawn since the Ottawa meeting:
 - b. Update on applications from 2020:
 - c. New and re-applications:
 - d. Prospective IMOs: KIR
3. IMOs of concern
 - a. Resolved IMO issues since last meeting:
 - b. Lists of IMOs of concern and IMOs awaiting checking:
 - c. Support for data checkers on IMO data quality issues
 1. Example case:
 - d. Status of the discussion document on the IMO one-minute data checking procedure
4. IMO Subcommittee contributions to the Technical Manual
 - a. Update on customs regulations for high specification magnetometers
5. Standards
 - a. Easing of standards (e.g. absolute observation frequency) during 2020-2021 in light of COVID-19 restrictions?
 - b. Handling leap-seconds in one-second data
 - c. Current status of instrumentation meeting the one-second standard
6. IMO Subcommittee Action Items following the 2021 Online Meeting

11.3 Action Items from the 2020 online meeting

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	Status Green completed, Orange ongoing; Red not started
IMO.A1	CT, SF	Include a note in the communication to IMOs that there are the two delays available on the web site (plotting and data download)	Completed The note did not specify two delays, but it drew attention to the fact that delays are possible and that CB can be contacted for details
IMO.A2	JM, CT	Include a statement in the communication to IMOs on dual use customs regulations and its impact on export of magnetometers	Completed
IMO.A3	CT	Request EXCON issue IMO withdrawal letters	Completed (13 Aug 2020)

IMO.A4	CT	Issue non-compliance letters	Completed (24 March 2021)
IMO.A5	CT	Review status of accepted definitive data on 1 st October 2020	Not completed See IMO report
IMO.A6	TR, BH	Copy the discussion document on IMO data checking to GitHub	Deleted Document is on Nextcloud, not GitHub and under review during meeting. Replaced by AI DD.1 from this meeting
IMO.A7	CT	Make a request of the Definitive Data Subcommittee that the next call for one-minute data makes a requirement that IMOs include the output report of check1min list of definitive data files and make it clear to data checkers that this is a new requirement.	Completed
IMO.A8	CT	Notify observatory of the application feedback of the IMO Subcommittee	Completed (12 Aug 2020)
IMO.A9	CT	Notify observatory of the application feedback of the IMO Subcommittee	Completed (12 Aug 2020)
IMO.A10	CT	Set a date for an interim online IMO Subcommittee meeting	Not completed

11.4 IMO Applications

11.4.1 IMOs closed or withdrawn since the July meeting:

Notification of withdrawal letters were issued on 13 August 2020, with subsequent correspondence on re-application (see below).

Note that a number of former IMOs have up-to-date real-time, variometer data on the INTERMAGNET FTP site. CT to request that VM removes the synchronisation between these observatories and the INTERMAGNET FTP site (Completed during the meeting).

11.4.2 Update on applications from 2020:

This section has been removed from this public copy of the minutes as it contained discussion about individuals and observatories

11.4.3 New applications:

This section has been removed from this public copy of the minutes as it contained discussion about individuals and observatories

11.4.4 Prospective IMOs:

This section has been removed from this public copy of the minutes as it contained discussion about individuals and observatories

11.5 IMOs of concern

11.5.1 Resolved IMO issues since last meeting

This section has been removed from this public copy of the minutes as it contained discussion about individuals and observatories

11.5.2 IMOs of concern and IMOs awaiting checking

This section has been removed from this public copy of the minutes as it contained discussion about individuals and observatories

11.5.3 Support for data checkers on IMO data quality issues

There are a number of IMOs that require a large amount of checking and correspondence with the institute to resolve definitive data quality or metadata issues. Some of these issues span a number of years or result in difficult judgements as to whether the data are of sufficient quality to meet the INTERMAGNET one-minute definitive data standard. Some data checkers have a large work load in attempting to resolve instrumentation, data processing or formatting problems with a particular institute and, as a result of ambiguity in the interpretation of standards, there is inevitably a difficulty in maintaining a consistency in quality benchmarks across the network. These issues are not necessarily picked up by the review of IMOs conducted by the IMO Subcommittee chair, particularly for data checkers outside of OPSCOM.

The more the task of checking and validating data and metadata can be assigned to the institutes submitting IMO data, the less the burden should be on the data checker, hence the communication to IMOs in the last call for one-minute data that submission of 2020 data should include the output report of check1min program.

Further to this, the Discussion Document being prepared by TR & BH on the one-minute data checking procedure will provide institutes with guidance on the quality benchmarks expected and a set of validation tasks to be carried out before definitive data are submitted.

However, there will continue to be cases where a data checker would benefit from input from the INTERMAGNET Operations Committee as a secondary opinion. These are likely to include cases where:

- Communication with an institute over a significant period of time has not resulted in a satisfactory resolution of a definitive data quality problem, a file formatting error or a metadata error
- There is a question over whether a definitive data submission meets the INTERMAGNET one-minute definitive data standards

The IMO Subcommittee therefore proposes that a communication is sent to the Definitive Data Subcommittee and the data checkers stating that the IMO Subcommittee would be willing to review any definitive data submission that falls into the one of the two categories above. If notified by a data checker, the IMO Subcommittee would review the data set at the next INTERMAGNET meeting and would decide to either accept the data as is, communicate directly with the institute to attempt to resolve the issue or send a letter of non-compliance to the institute if the criteria are met.

(Action Item IMO.8 CT)

11.5.3.1 Example case:

This section has been removed from this public copy of the minutes as it contained discussion about individuals and observatories

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

Work on this document is ongoing. The document will provide a guide for data checkers and also for IMOs submitting definitive data.

11.6 IMO Subcommittee contributions to the Technical Manual

11.6.1 Update on customs regulations for high specification magnetometers

There are no further updates on customs regulations for magnetometers other than the information communicated to the IMOs following the 2020 meeting.

11.7 Standards

11.7.1 Easing of standards during 2020-2021 in light of COVID-19 restrictions

Feedback from subcommittee members suggests that travel and working restrictions imposed as a result of the 2020-21 COVID-19 outbreak have had an impact on operations at a number of observatories. Several IMOs operated by subcommittee members or those that subcommittee members have data checking responsibility for have reported difficulties in maintaining absolute observation programmes or delays to data processing during 2020-21. While it is difficult to set a rule on relaxing the standards during this period data checkers could accept that some gaps in absolute observations at observatories (which typically have stable baselines) may be acceptable. This needs to be assessed on a case-by-case basis. Definitive data can be referred to the IMO Subcommittee by data checkers if there are any questions over this.

11.7.2 Handling leap-seconds in one-second data

To be carried forward to the next meeting.

11.7.3 Current status of instrumentation meeting the one-second standard

To be carried forward to the next meeting, although this is most suited to the dissolved Instruments and Data Acquisition subcommittee.

11.8 Decisions and Action Items

11.8.1 Action Items following the 2020 meeting

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

Action	Responsible	Description
IMO.A8	CT	Send a communication to the Definitive Data Subcommittee that data checkers have the option of referring problematic definitive data sets to the IMO Subcommittee for review

12 Technical Manual Subcommittee

Subcommittee Members: Benoit St-Louis (chair), Chris Turbitt (deputy), Stephan Bracke, Andrew Lewis, Jürgen Matzka, Hiroaki Toh

12.1 Meeting overview

The Technical manual subcommittee met on Tuesday March 23, 2021 via an online meeting where SB demonstrated the proposed tools for the Technical Manual development and collaboration, and also through documents on the GFZ NextCloud portal.

12.2 Agenda

- 1 Review of July 2020 actions items / Mid-Year October 2020 progress
- 2 Technical Manual
 - a. DOI
 - b. Future versions
 - i. Development platform (presentation from Stephan Bracke)
 - ii. Integration with WEB site
 - iii. Distribution format
- 3 WEB
 - a. Links to data format in the Technical Manual
 - a. Other links to/from the web site
 - b. Policy and Technical notes to be published
 - c. FAQ maintenance
- 4 Round table
- 5 Distribution of actions items
- 6 Schedule next video conference

12.3 Review of actions items from July 2020 online meeting

Action	Responsible	Description	Status (Green = completed, Orange = ongoing; Red = not started)
TM.A01	EXCON	Provide DOI names for the INTERMAGNET technical document series and for the publisher.	Not started, AT mentioned that EXCON will look at it during the March 2021 meeting.
TM.A02	BSL	Organize a video conference with the Technical Subcommittee members in October to prepare the publication of the next version of the Technical Manual.	Completed, TM met online Oct28, 2020.
TM.A03	JM	Production of QD data. Might be desirable as a follow-up from Hermanus action TM.12 which was converted to submission. As a first step, insert related FAQs in the Technical Manual.	Completed, email June 2020, TM.17

TM.A04	JM	Review the manual to include the new INTERMAGNET Reference Data Set (IRDS). Replace CD, DVD and USB with INTERMAGNET Physical Media (IPM).	Completed
TM.A05	JM	Consult with Vincent Lesur (IPGP) to see if he started the development of a document on the estimation of errors in the production of Definitive Data.	Completed
TM.A06	AL	Add INTERMAGNET new licensing description of CC-BY-NC 4.0.	Not started
TM.A07	CT	Look at TN and FAQs for QD information to be added to the TM	Not started
TM.A08	JM	Description on the use of DOIs for data/metadata publication in INTERMAGNET.	Not started
TM.A09	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	Ongoing , RL offered to write a section on flagging
TM.A10	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, updated text will be included in V-5.1.0
TM.A11	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.A12	BSL	Consult with CB & JF to format TM in an HTML form suitable for GIT that optimises the production of PDF formats of future versions of the manual (beyond V 5.0.0 release)	Completed
TM.A13	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, updated text will be included in V-5.1.0
TM.A14	BSL	In Chapter 2 - not clear what the definitions of the data types are – add pointer to definition/relevant text.	Ongoing, updated text will be included in V-5.1.0
TM.A15	JM	Section 2.3.9 – add text describing where the gp ratio is used.	Not started
TM.A16	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, updated text will be included in V-5.1.0

TM.A17	JM	Data quality: proofread the guide to the process of despiking data.	Ongoing, basically finished except one typo and the addition of a short comment on how Z- is affected in N and S hemisphere by cars and other magnetic objects
TM.A18	DD Subcommittee	Section 6.4.3.3 Update to describe the USB structure.	Not started
TM.A19	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"	Not started
TM.A20	CB	p 47 part on toolkit used to make website will need to disappear when moving to GitHub.	Not started
TM.A21	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.	Ongoing, request passed to EXCON
TM.A22	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
TM.A23	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.	Ongoing (see Agenda DD.5)
TM.A24	BSL	Appendix C-1: Change use of deltaF for "G"	Ongoing, updated text will be included in V-5.1.0
TM.A25	JM	Appendix C-1: Orientation of "UVZ" has no definition in Section 6.1.3	Ongoing, should place a separate section for variometer orientation between 4.6 VARIOMETER OPERATIONS and 4.7 BASELINE CALCULATION
TM.A26	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.A27	SB	Evaluate the various options of contributing and version controlling under the GitHub environment.	Completed
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12.4 Technical Manual

12.4.1 Digital Object Identifier (DOI) for the Technical Manual

A DOI for the Technical Manual has been requested and Kirsten Elger from GFZ suggested to publish not only the TM but also other documents in a series that could be called “INTERMAGNET Technical Reports” (name also recommended by the TM subcommittee). The name is open to discussion and EXCON should make the decision. Suggestions for the publisher are “INTERMAGNET and Albert-Einstein Library” or “INTERMAGNET and GFZ” or “INTERMAGNET”. Again, EXCON should make the decision.

Action Item TM 01 EXCON. No progress has been made but AT mentioned that this action item will be discuss during the March 2021 meeting.

12.4.2 Future versions

12.4.2.1 Development Platform (presentation from Stephan Bracke)

SB gave an exhaustive presentation on the benefits of the new proposed tools to create a development/collaboration environment for future versions of the Technical Manual. recently, the manual was converted to PHP to allow the integration with the intermagnet.org web site and to generate PDF for easy download and printing. The INTERMAGNET TM Subcommittee consider these features important and was looking for a replacement solution compatible with the transfer of the WEB site to intermagnet.github.io which does not support that format. The Subcommittee was also looking for a system that would allow version control and some level of automation in the generation of the distribution products. During this meeting, the Technical Manual Subcommittee has adopted the use of GitHub for the community to submit their contribution, the use of Sphinx with RST format to generate the various products such as pdf, html etc. and, the use of ReadTheDocs to automate the generation of the release versions on a GitHub commit. Despite the fact that the manual will be kept in ReStructuredText Format, most contributors will only provide edits in text format on GitHub. The formatting of the various sections of the manual will remain the responsibility of the Technical Manual Subcommittee. The next steps will be for the TM Subcommittee (mainly SB) to configure a dedicated environment to INTERMAGNET for the TM on GitHub **Action Item TM 03 SB** and ReadTheDocs **Action Item TM 04 SB** and, to convert the current version of the manual to RST **Action Item TM 05 SB & TM Subcommittee**.

12.4.2.2 Integration with WEB site

There are two possibilities to integrate the INTERMAGNET WEB site with the Technical Manual to allow for example live links from the data format page to the formats in the Technical Manual. The first one (the easiest) would be to host the manual on ReadTheDocs directly but that comes with the disadvantage of having open-source advertising and the second one would be to move the generated HTML pages to GitHub which can't be fully automated. The Subcommittee has decided to start developing the product using the ReadTheDocs option while this can be discussed in INTERMAGNET **Action Item TM 27 AL & Plenary**.

12.4.2.3 Distribution format

During the implementation of the new tools, releases of the Technical Manual will be done in PDF format only and made available on GitHub. Enough information has been collected to generate a minor release by mid-term of the next INTERMAGNET meeting.

12.5 Web

The subcommittee had very little time to discuss the WEB issues during this meeting and most of the topics have been postponed to the next meeting.

12.5.1 Links to data format in the Technical Manual

On hold until the new environment is available on GitHub.

12.5.2 Links to data format in the Technical Manual

On hold until the new environment is available on GitHub.

12.5.3 Policy and Technical notes to be published

Ongoing updates.

12.5.4 FAQ maintenance

Ongoing updates.

12.6 Round table

No addition to the agenda

12.7 Decisions and Action Items

12.7.1 Decisions

Decision	Description
TM.D01	It was decided that the new source format for the TM would be RST and the new development/collaboration platform would include GitHub, Sphynx and ReadTheDocs.

12.7.2 Action Items

Action	Responsible	Description
TM.A01	EXCON	Provide DOI names for the INTERMAGNET technical document series and for the publisher.
TM.A02	BSL	Publish TM V-5.1.0 by mid-term with the new information currently available.
TM.A03	SB	Configure a dedicated environment to INTERMAGNET for the TM on GitHub.
TM.A04	SB	Configure a dedicated environment to INTERMAGNET for the TM on ReadTheDocs.
TM.A05	SB & TM subcommittee	Convert the current version of the manual to RST.

TM.A06	AL	Add INTERMAGNET new licensing description of CC-BY-NC 4.0.
TM.A07	CT	Look at TN and FAQs for QD information to be added to the TM
TM.A08	JM	Description on the use of DOIs for data/metadata publication in INTERMAGNET.
TM.A09	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.A10	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
TM.A11	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.A12	SB	Create documentation for TM Subcommittee on the new collaboration tools.
TM.A13	BSL	Page 5 par 2 ... recognized format – could add a pointer to the section in the document that describes that. Section 6.1.1
TM.A14	BSL	In Chapter 2 - not clear what the definitions of the data types are – add pointer to definition/relevant text.
TM.A15	JM	Section 2.3.9 – add text describing where the gp ratio is used.
TM.A16	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.
TM.A17	JM	Data quality: proofread the guide to the process of despiking data.
TM.A18	DD Subcommittee	Section 6.4.3.3 Update to describe the USB structure.
TM.A19	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.A20	CB	p 47 part on toolkit used to make website will need to disappear when moving to GitHub.
TM.A21	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.
TM.A22	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.A23	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.A24	BSL	Appendix C-1: Change use of deltaF for “G”
TM.A25	JM	Appendix C-1: Orientation of “UVZ” has no definition in Section 6.1.3
TM.A26	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).

TM.A27	AL	Start a plenary discussion on ReadTheDocs' advertising.
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12.8 Schedule next video conference

The TM subcommittee had a mid-term video conference meeting in Oct 2020 between the two main on-line meetings which were 8 months apart. The next proposed main meeting is only 6 months away so it was decided during this meeting not to have a mid-term on-line meeting but continue to exchange documents as needed.

13 Appendix

13.1 Agenda

13.1.1 Monday March 22 Plenary session

Topic	Type	Lead by	Document(s)
Discussion on OPSCOM membership	Discussion	S Flower	meeting_2021/discussions/membership
Review of plenary action items from previous meeting	Discussion	A Lewis	meeting_2021/discussions/Online_2020-PlenaryActions.docx
Communication in INTERMAGNET	Discussion	S Flower	meeting_2021/discussions/communication
Presentation: Progress on one second data	Presentation	J Reda	presentations/Progress_on_one_second_data.pptx
Presentation: Report on Definitive Data	Presentation	J Reda	presentations/Report_on_definitive_data_timelines.pptx
Presentation: Next version of the Technical Manual (integration with GitHub)	Presentation	S Bracke	presentations/future_tech_man.pptx
Presentation: Progress on IRDS and DOIs	Presentation	S Flower	presentations/IRDSAndDOIProgress.pptx
Presentation: Future of the INTERMAGNET data archive and web service	Presentation	S Flower	presentations/ArchiveTransferProgress.pptx

13.1.2 Tuesday March 23 Subcommittee and EXCON sessions

Topic	Type	Lead by	Document(s)
EXCON to meet by video conference, details to be arranged		A Thomson	
Review of Definitive Data Subcommittee actions from previous meeting	Discussion	J Reda	
Review of IMO Applications Subcommittee actions from previous meeting	Discussion	C Turbitt	
Review of Technical Manual actions from previous meeting TM meets by videoconference @11H00 UTC	Discussion	B St-Louis	
Review of WWW/GINS & Data Formats Subcommittee actions from previous meeting	Discussion	C Blais	

13.1.3 Wednesday March 24 Subcommittee and EXCON sessions

Topic	Type	Lead by	Document(s)
EXCON to meet by video conference, details to be arranged		A Thomson	
Review of Definitive Data Subcommittee actions from previous meeting	Discussion	J Reda	
Review of IMO Applications Subcommittee actions from previous meeting	Discussion	C Turbitt	
Review of Technical Manual actions from previous meeting	Discussion	B St-Louis	
Review of WWW/GINS & Data Formats Subcommittee actions from previous meeting	Discussion	C Blais	

13.1.4 Thursday March 25 Free day

Subcommittee chairs summarise their discussions

13.1.5 Friday March 26 Plenary sessions

Topic	Type	Lead by	Document(s)
Report and discussion on IMOs	Discussion	C Turbitt	
Report on definitive data timeliness	Presentation	J Reda	presentations/Report_on_definitive_data_timeliness.pptx
Report, decisions and action item list from EXCON	Report	A Thomson	
Report, decisions and action item list from Definitive Data Subcommittee	Report	J Reda	
Report, decisions and action item list from IMO Applications Subcommittee	Report	C Turbitt	
Report, decisions and action item list from Technical Manual Subcommittee	Report	B St-Louis	
Report, decisions and action item list from WWW/GINS & Data Formats Subcommittee	Report	C Blais	
Review and agreement on decisions and action items from plenary sessions	Report	A Lewis	
Date and place of next meetings	Discussion	S Flower	meeting_2021/discussions/next_meeting