

INTERMAGNET Meeting Minutes – Public Edition

Hosted by
Natural Resources Canada
at
Four Points Sheraton
35 Rue Laurier, Gatineau, QC J8X 4E9
Canada

Saturday 20 – Monday 22 July 2019



Participants:

EXCON:

David Boteler (DB) NRCAN, Canada
Gauthier Hulot (GH), IPGP, France
Alan Thomson (AT), BGS, UK

OPSCOM:

Charles Blais (CB), NRCAN, Canada
Stephan Bracke (SB), IRM, Belgium
Simon Flower (SF), BGS, UK
Benoît Heumez (BH), IPGP, France
Roman Leonhardt (RL), ZAMG, Austria
Andrew Lewis (AL) GA, Australia
Jürgen Matzka (JM), GFZ, Germany
Jan Reda (JRD), IoG PAS, Poland
Hiroaki Toh, (HT), KU, Japan
Chris Turbitt (CT), BGS, UK

Guests:

Seiki Asari, JMA, Kakioka, Japan
David Calp, NRCAN, Canada
Ellen Clarke, BGS, UK
Abe Claycomb, USGS, USA
Kirsten Elger, GFZ, Germany
Jeremy Fee, USGS, USA
Gerrit Jansen van Beek, contractor, OH, Canada
Tsubasa Kotani, KU, Japan
Kristen Lewis, USGS, USA
Jeff Love, USGS, USA
Jill McCarthy, USGS, USA
Achim Morschhauser, GFZ, Germany
Larisa Trichtchenko, NRCAN, Canada

The following OPSCOM members participated via
online communications for selected sessions:

Sergey Khomutov (SK), IKIR, Russia
Virginie Maury (VM), IPGP, France
Tero Raita (TR), UO, Sodankylä, Finland

Absent Benoît St-Louis (BSL), NRCAN, Canada

Institute Abbreviations:

BGS – British Geological Survey

JMA - Japan Meteorological Agency

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

JMA – Japan Meteorological Agency

KU – Kyoto University, Japan

NRCan – Natural Resources Canada

OH – Ontario Hydro

USGS – United States Geological Survey

ZAMG - Zentralanstalt für Meteorologie und Geodynamik, Austria

UO – University of Oulu, Finland

Table of contents

1	Welcome and introductions.....	10
2	Committee structure and membership	10
2.1	Executive Council (EXCON)	10
2.2	Operations Committee (OPSCOM).....	10
2.3	Changes to membership.....	11
3	Meeting agendas	11
3.1	GIN, WWW and Data Formats	11
3.2	Definitive Data	11
3.3	Technical Manual	11
3.4	IMO and Standards	12
3.5	Executive Council	12
4	Presentation of guests	12
5	<i>In-camera</i> discussions.....	13
5.1	Committee membership	13
5.2	Instruments and Data Acquisition Subcommittee.....	13
6	Review of plenary actions items from Vienna, 2018.....	13
7	Presentation in plenary sessions	16
7.1	Progress on publication of the Technical Manual (CT).....	16
7.2	Publication of one-second data (JRD)	16
7.3	Licensing and DOIs (SF).....	17
7.3.1	Licensing	17
7.3.2	DOIs	17
7.4	INTERMAGNET Reference Data Set (SF).....	17
7.5	Future of the INTERMAGNET web site and web service (CB/SF).....	17
7.6	Canadian Hazard Information Service (CB)	18

7.7	USGS geomagnetic data framework and planning (J. Fee)	18
7.8	EPOS and metadata (SF)	19
7.9	INTERMAGNET digital object identifiers (K. Elger)	19
7.10	World Meteorological Organisation and OSCAR (L. Trichtchenko)	20
7.11	INTERMAGNET’s relationship with SuperMAG (JM)	20
7.12	Comparison of 2014 one-minute and one-second data (HT)	21
7.13	Proposal from Kakioka observatory (S. Asari)	21
7.14	NanoMagSat (GH)	22
7.15	Canadian variometer networks (G. Jansen Van Beek)	22
7.16	Vale Ole Rasmussen (JRD)	23
8	Next meeting	23
9	Closing	23
10	Decisions and action items following the Ottawa meeting	23
10.1	Decisions	23
10.2	Action items	23
11	Executive Council	26
11.1	Agenda	26
11.2	Review of action items from Vienna, 2018	26
11.3	Discussion potentially leading to decisions	27
11.4	General discussion & information exchange	27
11.5	Decision and action items from Ottawa meeting	29
11.5.1	Decisions	29
11.5.2	Action items	30
12	Definitive Data Subcommittee	32
12.1	Agenda	32
12.2	Review of action items from Vienna, 2018	32

12.3	Reports on the 1-min and 1-sec definitive data collection.	33
12.3.1	Report of 1-min definitive data collection	33
12.3.2	Report of 1-sec definitive data collection	34
12.4	Status of publication USB 2015	34
12.5	Cross-checking 1-min and 1-sec definitive	36
12.5.1	one-second definitive data checking	36
12.5.2	Reported problems with cross-checking of 1-min definitive by TR	37
12.6	Publication of 1-min definitive data sets from 2016 onwards	37
12.7	Proposal from Kakioka: establishing of cross-checking task team and making this public.....	38
12.8	Calculation of minute means and annual means, how to treat past, present and future non-compliance	39
12.9	Issues related to yearmean files and IYFV1.01 format.....	39
12.10	Decisions and action items following the Ottawa meeting	41
12.10.1	Action items	41
13	GINS/WWW and Data Formats Subcommittee	42
13.1	Agenda.....	42
13.2	Review of actions items from Vienna, 2018	43
13.3	GINS sending former IMO data.....	45
13.4	Licensing	45
13.5	CDF format.....	46
13.6	Future of the web	46
13.6.1	Web service.....	46
13.6.2	Plotting application	47
13.6.3	Data download application	47
13.6.4	GitHub.....	47
13.6.5	Web site	47

13.6.6	Issue tracking and discussions	47
13.6.7	Metadata system.....	48
13.6.8	Future of RSYNC	48
13.7	Decisions and action items following the Ottawa meeting.....	48
13.7.1	Action items	48
13.7.2	Actions items still open from previous meetings.....	49
14	INTERMAGNET Observatories & Standards Subcommittee.....	50
14.1	Agenda.....	50
14.2	Review of action items from Vienna, 2018	51
14.2.1	Action items	51
14.3	IMO Applications.....	52
14.3.1	IMOs closed or withdrawn since the Vienna meeting.....	52
14.3.2	Update on applications from 2018.....	52
14.3.3	New applications:.....	52
14.3.4	Prospective IMOs	52
14.3.5	Non-IMO data available on the IM FTP server.....	53
14.4	IMOs of concern.....	53
14.4.1	Data checker discussion.....	53
14.4.1.1	Is there a requirement for an independent arbiter on data quality checks?.....	53
14.4.1.2	Should we request reports from data checkers prior to INTERMAGNET meetings? .	53
14.4.2	Non-compliant IMOs new policy, web site requirements	53
14.4.3	Resolved IMO issues since last meeting	54
14.4.4	Lists of IMOs of concern and IMOs awaiting checking:.....	54
14.4.5	Report from BH on the IPGP network	55
14.4.6	Report at the 2018 meeting on the performance of IMOs meeting QD specification in 2015 – how to present results and how to feedback to IMOs.....	55

14.5	IMO Subcommittee contributions to the Technical Manual	55
14.5.1	Daily and annual mean calculations	55
14.5.2	Further definition of the “I – incomplete” flag in the IYFV1.01 data format required.....	56
14.5.3	Calculation of the F-component in the annual mean files.....	56
14.5.4	“Dual use” customs regulations for high specification magnetometers	56
14.5.5	Any outstanding items?	56
14.6	Standards.....	56
14.6.1	Handling leap-seconds in one-second data	56
14.6.2	GPS week number roll-over (6 April 2019)	56
14.6.3	Current status of instrumentation meeting the one-second standard	56
14.7	Decisions and action items following the Ottawa meeting.....	56
14.7.1	Decisions	56
14.7.2	Action Items	57
15	Technical Manual Subcommittee	59
15.1	Agenda.....	59
15.2	Committee membership	59
15.3	Review of actions items from Vienna, 2018	60
15.4	Technical Manual	64
15.4.1	Review status of draft version 5.0.0 draft 1.0.....	64
15.4.2	Publication of version 5.0.0	65
15.4.3	Create a list of new items for version 5.0.1	65
15.4.4	Digital Object Identifier (DOI) for the Technical Manual	65
15.5	Web.....	66
15.5.1	Synchronization of data format with Technical Manual (one source only with links)	66
15.5.2	Other links to/from the web site.....	66
15.5.3	Policy and technical notes to be published	66

15.5.4	FAQ maintenance.....	66
15.5.5	Web site review.....	66
15.6	Future of web site	66
15.6.1	Impact on Technical Manual distribution	66
15.6.2	Pros and cons of various formats (HTML, Markdown, Words etc.)	67
15.7	INTERMAGNET on Wikipedia.....	67
15.7.1	Check contents.....	67
15.7.2	Update as needed	67
15.8	Other topics	67
15.8.1	90% rule	67
15.8.2	Centring one-minute means on mm:00	68
15.8.3	Flagging data	68
15.8.4	Web services	68
15.9	Round table discussion.....	68
15.10	Decisions and action items following the Ottawa meeting.....	68
15.10.1	Decisions	68
15.10.2	Action Items	68
15.11	Schedule video conference in September	69
15.11.1	Set a date and time.....	69
15.12	Technical Manual work session	69
16	Work sessions (Monday 22 July)	71
16.1	Technical Manual updates (CT).....	71
16.2	GitHub demonstration (J. Fee, A. Claycomb).....	71
16.3	MagPY demonstration (RL).....	71
17	Appendix	72
17.1	Meeting agenda.....	72

INTERMAGNET Meeting Minutes

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

1 Welcome and introductions

The meeting was hosted by Natural Resources Canada, arranged by BSL and held at the Four Points Sheraton hotel, Gatineau, Québec, Canada. BSL was unable to attend the meeting due to commitments at Alert observatory so in his absence DB acted as meeting host. SF and DB described the logistics of the meeting and welcomed participants. AT introduced himself, welcomed and thanked participants and invited everyone to express their opinions, ideas and thoughts throughout the meeting.

2 Committee structure and membership

2.1 Executive Council (EXCON)

Alan Thomson*
David Boteler
Gauthier Hulot
Jeff Love [†]
Kristen Lewis ⁺

[†]Jeff Love acting USGS EXCON representative. ⁺Kristen Lewis acting as an observer from USGS

2.2 Operations Committee (OPSCOM)

Chair: Simon Flower* Secretary: Andrew Lewis

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

Since the previous meeting in Vienna EXCON member Carol Finn has retired and did not attend this meeting. The role of USGS representative on EXCON was fulfilled by Jeff Love during the meeting. Kristen Lewis attended EXCON meetings as an observer, on behalf of USGS. Achim Morschhauser was welcomed as a new member of OPCOM, details of his subcommittee memberships will be decided later.

3 Meeting agendas

SF described the structure and responsibilities of the INTERMAGNET sub-committees, the format of the meeting over the next three days and called for comments and updates to the meeting agenda. The agenda was accepted without change and is available in section 17.1.

Subcommittee chairs presented their meeting agendas. Details are available in sections 11 to 15.

3.1 GIN, WWW and Data Formats

CB noted that discussion on digital object identifiers is best placed in the DD sub-committee. The future of the INTERMAGNET website, the web service, the GitHub environment and the ImagCDF data format are the main item of discussion in GWD. CT requested GWD give consideration to the existence of data from non-IMOs or withdrawn IMOs on the INTERMAGNET FTP site.

3.2 Definitive Data

JRD noted the DD agenda will include a report on one-minute and one-second data; production of the USB for 2015 data; procedures and problems in cross checking one-minute and one-second data; publication of 2016 one-minute data and how to deal with non-compliance in calculating one-minute means. SF noted the 2015 data will be published for the last time on a physical medium which will include the full INTERMAGNET data set (1991 – 2015) and from 2016 onwards the concept of an INTERMAGNET Geomagnetic Reference Dataset will be introduced for on-line data publication. This annual on-line data set publication will include the entire INTERMAGNET data set to-date (1991-2016 for the first publication) and include any data corrections from previous years. AT called for ideas on an appropriate acronym for the INTERMAGNET Geomagnetic Reference Dataset.

CB raised the question of difficulties for users reading the IAF data format and SF noted format conversion software is available.

3.3 Technical Manual

CT, acting chair TM, presented the TM agenda on behalf of BSL. The main topics include reviewing the status of the draft version 5 of the INTERMAGNET technical manual and setting a publication date. The question of how best to maintain and distribute the manual in an on-line environment will also be considered and how the manual will fit-in with the future plans for the INTERMAGNET web site. Elaboration on manual content, including the 90% rule for dealing with missing data when means are calculated using filtering, and data flagging will also be discussed. The INTERMAGNET Wikipedia page will be considered.

3.4 IMO and Standards

CT presented the IMO agenda, which will include consideration of 4 new IMO applications; the growing number of IMOs of concern, and the need for an arbiter on data quality who is independent from the IMO and the data checker. A major topic for the committee is development of a policy on dealing with non-compliant IMOs. Standards issues to be raised include annual mean calculations; mean F component in year mean files; clarification of the meaning of the “I” (incomplete) flag in the IYF yearmean format; handling leap seconds; the recent GPS week roll-over and the status of instrumentation.

JM raised the issue of dual-use trade control regulations for international transport of magnetometers complying with the INTERMAGNET one-second standard and suggested the topic is of concern to the community and worth discussing in subcommittee.

3.5 Executive Council

AT described the role of EXCON as providing a strategic overview and interlink between INTERMAGNET and the wider community, while OPSCOM and the subcommittee do the detailed work of INTERMAGNET. AT presented the EXCON agenda, which is deliberately flexible to allow consideration of issues arising during the meeting. Specific items to be discussed are: future arrangements for hosting the INTERMAGNET web service; considering a request from the SuperMAG network for INTERMAGNET one-second data; how EXCON works; progress within the subcommittees particularly on the technical manual; DOI and licensing; one minute and one second data; new science opportunities; the MagQuest competition; nanoMagSat; documenting additional scientific instruments and facilities hosted at IMOs; improving communications; a publication to commemorate 25 years of INTERMAGNET data.

Jeff Love asked if guests can sit-in on the EXCON meeting and AT noted EXCON is a closed meeting, but guests can be invited to attend the meeting to participate on relevant topics.

4 Presentation of guests

Guests introduced themselves and nominated sub-committee meetings they would like to attend.

- Tsubasa Kotani, Kyoto University graduate student and INTERMAGNET data checker, works with HT.
- Kirsten Elger, GFZ, has been working with SF on developing DOIs for INTERMAGNET data and will present on the topic at this meeting.
- Kristen Lewis, USGS acting geomagnetism group leader, is here to learn about INTERMAGNET
- Jill McCarthy, USGS Director of Geologic Hazards Science Centre, wants to learn about INTERMAGNET and meet participants.
- Seiki Asari, Kakioka observatory, will present a proposal for Kakioka to join the INTERMAGNET data checking team and would like to participate in the DD subcommittee meeting.
- Abe Claycomb, USGS data and software management, is here to observe.
- David Calp, NRCAN is a data producer and INTERMAGNET data checker and would like to participate in the IMO subcommittee.
- Achim Morschhauser, GFZ NGK observatory, has been to several INTERMAGNET meetings, is interested in all areas of the meeting and would like to join the GWD and IMO subcommittees.
- Gerrit Jansen van Beek, retired, formerly NRCAN and now contractor to Ontario Hydro, will present a proposal for high quality variometer data to be listed on the INTERMAGNET web site.

- Ellen Clarke, BGS, has attended three INTERMAGNET meetings and would like to join the DD and GWD subcommittees.
- Jeremy Fee, USGS computer scientists, will participate in the GWD subcommittee.
- Jeff Love, USGS research scientist and former chair of INTERMAGNET EXCON, will represent USGS on EXCON.

Guests not present at this session:

- Larisa Trichtchenko, NRCan

5 *In-camera* discussions

5.1 Committee membership

Parts of this section have been removed from this public copy of the minutes as it contained discussions about individuals.

SF raised the need for a Spanish speaking member on OPSCOM to enhance contacts with South America and other Spanish speaking observatories. The 2022 IAGA geomagnetism workshop and summer school will be held at Vassouras and Tatuoca observatories in Brazil and will be a good chance to hold an INTERMAGNET meeting in South America and develop appropriate contacts. AT and JM suggested the South American LatinMAG and PanGEO meetings could also be opportunities to develop relationships within the region. BH mentioned IPGP has contacts with the Chilean Easter Island observatory. Committee membership for each subcommittee was considered by chairs. CB noted GWD requires members with technical and programming experience. JRD noted that DD was the largest subcommittee and membership will be considered later in the meeting. CT noted that IMO has a well balance membership but some people have problems attending meetings. CT reported BSL's view that TM membership was adequate and confirmed CB's view that more technical expertise is needed within GWD.

The issue of sponsorship funding for members to attend INTERMAGNET meetings was raised and it was decided the best practical solution is for individual institutes to arrange sponsorship whenever needed and possible.

5.2 Instruments and Data Acquisition Subcommittee

Convening the IDA subcommittee was considered, specifically with reference to discussing the INTERMAGNET 1-second data standard, which had been raised prior to the meeting by several participants. The topic was considered relevant and it was decided to defer discussions for later in this meeting if time allowed. The IDA committee did not convene during this meeting.

6 Review of plenary actions items from Vienna, 2018

Number	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	Completed

		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	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
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 and 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 IMOContacts by 24 weeks after completion of the meeting	Completed
P.A10	subcommittee chairs	Arrange an online subcommittee meeting or document meeting before the next face to face meeting.	Completed, DD held a formal meeting, others committees had active email/document exchanges.
P.A11	SF	Request committee members for recommendations on targeted invitations by 10 weeks before the next meeting	Completed
P.A12	AT	Invite IAGA representative to attend next meeting	Completed but not accepted by IAGA due to recent committee changes. The invitation is on-going.
P.A13	SF	Commence arrangements for the next meeting with the local host by 10 weeks before the next meeting	Completed

P.A14	SF	Finalise the list of attendees and resolve any non-attendance issues 6 weeks before the next meeting	Completed
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 discussion on Communications as a standing agenda item	Not included as a formal item; discussions concluded that communication is greatly improved.
P.A17	SF	Announce INTERMAGNET meetings on Worldobs mailing list	Completed
P.A18	AT	Arrange and deliver an INTERMAGNET briefing during the IAGA Div V-Obs business meeting at IUGG assembly Montreal 2020	Completed
P.A19	AT	Arrange an INTERMAGNET discussion session during the next IAGA observatories workshop	To be completed
P.A20	SF	Publish draft agendas 2 weeks before the next INTERMAGNET meeting	Completed
P.A21	SF	Arrange an INTERMAGNET “trade-desk” at the IUGG Montreal meeting	Decided against trade-desk; an INTERMAGNET poster (with QR code) and info business cards were printed and distribute at IUGG.
P.A22	AT	Investigate data disclaimers and the question of liability in relation to commercial/private funded observatories joining INTERMAGNET	To be completed; no reply from BGS legal team. Requires some more discussion in EXCON given IMAG is not a legal entity
P.A23	VM	Remove old versions of IMCDView from Paris GIN	Completed
P.A24	SF	Publish new version of IMCDView and data format conversion software on GitHub	To be completed
P.A25	SF	Investigate machine readability of creative commons licensing	Completed – licensing to be added to data files
P.A26	Committee members	Suggest suitable topics for policy notes.	Completed
P.A27	SF and committee members	Update subcommittee membership lists and categorise committee affiliations into primary and secondary.	Completed

7 Presentation in plenary sessions

7.1 Progress on publication of the Technical Manual (CT)

An update on publication of the next edition of the Technical Manual, presented on behalf of BSL.

Minor editorial changes to version 5 of the technical manual will be identified during this meeting and BSL will implement those changes soon after the meeting, with the intention of publishing the manual late in September. An online meeting of TM to address any final issues will be scheduled for mid-September. The manual will be published on-line in HTML and PDF format, and possibly later, using Markup format. CB mentioned there may be issues within NRCan on availability of resources to make this happen and SF noted it will be good to have different options and formats available but it is important to publish in the first place.

A working session will be arranged for the end of this meeting to proof-read, check details and definitions in the draft version 5 manual. It was confirmed the new edition of the technical manual will have a DOI.

Additional tasks on the final day could also include checking the INTERMAGNET web site and Wikipedia page.

7.2 Publication of one-second data (JRD)

A discussion on progress and issues on publishing one-second definitive data.

Since 2014 INTERMAGNET has called for IMOs to provide one-second definitive data. In 2014 data were requested in IAGA2002 format, since 2015 data were requested in ImagCDF format. The table below summarises data submissions to date.

Year	Data Format	Number IMO submitted	Number IMO Accepted	Comments
2014	IAGA2002	38	36	
2015	ImagCDF	36	12	USGS IMOs accepted
2016	ImagCDF	36	11	USGS IMOs accepted
2017	ImagCDF	7	0	ABK BD EBR LYC TUC UPS WIC
2018	ImagCDF	4	0	ABK LYC UPS WIC

Despite the call for data in ImagCDF format for 2015 onwards, some IMOs continued to provide data in IAGA2002 format and it is those IMOs (from USGS) that have been checked and accepted for 2015 and 2016. The difference between the numbers of submitted and accepted IMOs for 2015 and onwards is not because data have been rejected but because data have not yet been checked. At this time there are inadequate resources available (both software and skilled people) to check data submitted in ImagCDF format.

The checking procedure calculates one-minute data from the one-second data submissions and compares with published definitive one-minute data. One-second data are also reviewed using AutoPlot and/or MagPY software. The increased volume of one-second data when compared to one-minute data make it more difficult to review the data.

There are no additional metadata files required for the one-second data submissions. At this time one second data are only available from “step-2” on the Paris GIN via ftp with access via username and password – this means data are not publicly visible or available.

To improve the process of checking and publishing one-second data a control system is required, similar to the well-established process used to check and publish one-minute data.

Additional resources (people and software) are required for the one-second data checking.

Ellen Clarke asked if data checks included confirming data meet the INTERMAGNET one-second data standard – this is not checked but SF noted the ImagCDF format includes metadata to record which aspects of the data standard are met.

7.3 Licensing and DOIs (SF)

An update on licensing and Digital Object Identifiers within INTERMAGNET.

7.3.1 Licensing

INTERMAGNET has now adopted the CC-BY-NC 4.0 data licence. The licence page on the INTERMAGNET draft website has been updated to reflect this (intermagnet.github.io) but not yet on the official website (www.intermagnet.org)

7.3.2 DOIs

A DOI has been published for the 2013 data set (<http://doi.org/10.5880/INTERMAGNET.2013>). Now that agreement has been reached and a format for the landing page established publishing a DOI for the 2014 data should be simple process. Preparing metadata for the 2015 USB is a larger task due to the addition data on the USB, so a DOI for that publication will require more work.

7.4 INTERMAGNET Reference Data Set (SF)

Plans for on-line publishing data after 2015.

For 2016 and onwards definitive data will be annual on-line publications and include all previously available data (back to 1991) with corrections applied. Data corrections will be overwritten rather than including *errata* information as has been done in the past. A DOI will be minted for each annual data set. In order to encourage IMO's to submit data in a timely manner the deadline will be set as the publication date for the DOI.

7.5 Future of the INTERMAGNET web site and web service (CB/SF)

Changes within the Canadian government impacting INTERMAGNET operations.

Parts of this section have been removed from this public copy of the minutes as it contained discussions about individual institutes.

The web site and web services are currently hosted by NRCan. Changes to IT policies within the Canadian government mean changes to the INTERMAGNET systems must be implemented. There is now a central entity, Shared Services Canada, which will manage Canadian government IT services. This means all Canadian government data centres must be migrated to centralised facilities under a fee-for-service regime. Phase 1 of this process for INTERMAGNET has been completed. Phase 2 involves an “application discovery” exercise to identify any security concerns with older software applications. CB and J. Fee have started addressing some of these challenges by setting up a draft web site at intermagnet.github.io The new site makes use of the BGS geomagnetic metadata system and some applications using existing NRCan web services. Moving the web site to github.io will allow direct community input to share the load of managing and updating the site. Any changes to the site require approval from one or more INTERMAGNET officers. Feedback on the content, look and feel of the github version of the website is required from the committee members and the community. The transition from www.intermagnet.org to intermagnet.github.io requires further discussion within GWD. The INTERMAGNET data archive cannot be hosted on github but there are other services available at a cost which may be suitable. GH suggested it may possible for INTERMAGNET to bid for funds from

national/international funding bodies to set-up and run the archive. SF believes INTERMAGNET data should remain fully under the control of INTERMAGNET and reside within archives managed by institutes associated with INTERMAGNET.

SF reported the web service hosted at NRCan has not been functional for some time due to overloading of data requests causing problems with other operations at NRCan. Re-instating operations of the web service is an urgent issue for INTERMAGNET. In the short term there is a plan to use existing infrastructure at BGS and Hyderabad to host the web service, with NRCan providing data from Ottawa for a period of about one year until other arrangements can be finalised.

Once a final candidate to host the web service has been identified data will be provided directly from the GINs without involving Ottawa.

Further consideration is required to decide the future of the data archive.

The technical manual could also be set up as a repository on github which will allow easier community input and sharing content and cross referencing between the web site and technical manual. It should also be possible to manage version control (with DOI) and releases of the manual in other formats such as PDF.

7.6 Canadian Hazard Information Service (CB)

An overview of the CHIS.

The Canadian Hazard Information Service includes Canada's geomagnetic, space weather, seismology, landslide, volcano and nuclear emergency services. CHIS has distributed offices and two fully supported mission-critical data centres. There are 150 seismic stations and 13 (soon to be 14) geomagnetic observatories in the system. There is a web site, twitter account and tailored services for public information.

System state-of-health parameters for remote sensor and data centre server networks are monitored using the Nagios software system. The SeisComP3 system is used for data transfer and managing the seismic and geomagnetic sensor network (once data are converted for transmission via SEEDlink). Data latencies are generally just a few seconds. The system includes a job management/ticketing system to manage issues.

7.7 USGS geomagnetic data framework and planning (J. Fee)

Modernisation work for geomagnetic data systems within the United States Geological Survey.

The USGS operates in a similar environment to the Canadian system, the Geological Hazard Science Centre includes earthquake, landslide and geomagnetic programs and work is underway to adopt common infrastructure across all the programs whenever possible.

USGS has 14 IMOs and a geomagnetic research group. The current data acquisition system is called PC Data Collection Platform (PCDCP) and uses GOES satellite data transmission. The system was later adapted to use "Earthworm" and internet data transmissions.

The EDGE system was adopted by the seismic group using the miniSEED format and geomagnetic data was adapted to this system.

Web Absolutes is a web service for real-time entry and processing of absolute observations. Geomag Algorithms integrates with EDGE for real-time geomagnetic data processing.

Incremental changes to deal with one-second definitive data processing has increased the workload for data processors and the system is now near the limit of its capability. Work is underway on improving the systems, including optimizing output to miniSEED format, transmitting data using SEEDlink with only seconds of data latency to facilitate processing and publishing data in true real-time. The new system also addresses some timing inconsistencies inherent in the old system.

Work continues on web services for data and absolutes and Magpy-style data flagging.

7.8 EPOS and metadata (SF)

An update and future plans for the geomagnetic metadata system.

EPOS funded a geomagnetic observatory metadata system to hold such information as location, instruments and contact details. The goal is to have a system which is easy to populate and update and also fulfil international metadata standards. The system was developed by BGS and has been peer reviewed by the community and database experts. The metadata database is now available through BGS web services and is being used by the draft INTERMAGNET web site and EPOS.

The next task is to generate reports on content held about individual observatories, provide this information to observatories and call for corrections and updates. The reports will probably be bundled with the annual "call-for-data" request from the WDC – Edinburgh at the start of 2020.

A facility for on-line data entry and correction is a goal but requires much work and is yet to be implemented.

7.9 INTERMAGNET digital object identifiers (K. Elger)

DOIs: What, why and how with special reference to citing observatory data and future plans for INTERMAGNET data citation.

A DOI is a permanent link, initially developed for on-line articles. It is the DOI publisher's responsibility to confirm the DOI always points to a valid landing page and data are available. It is GFZ policy that data for DOI's issued by GFZ are held in GFZ's data centre. The DataCite organisation sets international rules and policies on DOI's and there is much policy and international agreement behind DOIs as they are registered, reachable, citable, trackable and persistent. Data repositories issuing DOIs must be approved following a formal process.

DOI metadata is important as it is harvested by other portals which increases visibility of datasets. DOI landing pages should cite all data sources contributing to the data set.

A group of data publishers and data repositories have developed a statement of commitment to improve citation and cross-links between published papers and data. Data DOIs can be cited in papers and data repositories can include references to papers. Researchers must now learn how to properly cite data in papers and this is progressing slowly.

Scholix is a new development supported by some large publishers and data centres to enable connections and interoperability between data sets and published papers. This initiative is necessary as papers can be published before data are cited with DOIs so links may need to be established between the paper and the data *after* the paper has been published.

There are currently three DOIs for INTERMAGNET definitive data; one for INTERMAGNET; one for the French observatory network, and one for the USGS network. There are differences in metadata for each of these three DOIs and this demonstrates the need for standards and recommendations in metadata as more institutes develop DOIs for their observatory data.

The 2013 INTERMAGNET definitive data set has a DOI, metadata and landing page hosted by GFZ. The 2014 INTERMAGNET definitive data set will be treated similarly to the 2013 data set with a DOI issued by GFZ. From 2015 onwards there will be a full reference data set comprising the entire data set (1991 onwards) with any corrections applied. This means more data storage will be required and there will be much redundancy each year. Each annual reference data set could have the same DOI but with a new version number if this is permitted by the DOI controlling bodies.

There are other magnetic observatory data products which could be made more visible with DOIs such as variation minute data, hourly means etc.

GH and J Love questioned how DOIs are guaranteed to be persistent and how citations are managed and SF noted that policies for citation are yet to be decided. All IMOs could have their own DOI which could be included in the over-arching INTERMAGNET DOI.

DB asked if institutes typically have DOIs for each observatory or for an observatory network. The French and USGS use one DOI for their entire network.

SF noted that INTERMAGNET should make recommendations to IMOs on DOIs but more work is required before this can happen.

7.10 World Meteorological Organisation and OSCAR (L. Trichtchenko)

An update on progress and demonstration of the WMO OSCAR metadata system as applied to space weather and observatory data.

Since 2008 WMO has been interested in space weather and geomagnetic measurements. In June 2019 a four-year plan (2020-2023) was presented on WMO's involvement in space weather.

The WMO Integrated Global Observing system (WIGOS) already includes space-based observations on space weather (Observing System Capability Analysis and Review - OSCAR Space). It has been more difficult to implement the system for surface observations of space weather (OSCAR Surface) but it is now starting to develop. OSCAR is purely metadata; no data are held by WMO.

WMO has extensive documentation on metadata standards and on-line instructions on how to use OSCAR.

An on-line demonstration of how to use the OSCAR system to locate geomagnetic observatory metadata was provided and it was clear the system is not optimised to locate ground-based geomagnetic observatory information. Improvements have been identified and will be implemented soon.

J. Fee and AT asks how we ensure all INTERMAGNET observatories are included in the system - INTERMAGNET cannot enter data as data entry must be managed by national representatives. Data entry can be completed on-line.

AT asks if there are advantages for INTERMAGNET and J. Love questioned if the effort of entering metadata for national observatories can be justified given there are other metadata systems.

7.11 INTERMAGNET's relationship with SuperMAG (JM)

Information on SuperMAG and the relationship with INTERMAGNET.

SuperMAG is funded by the US National Science Foundation with Jesper Gjerloev the principal investigator. There are many national observatory networks contributing data to SuperMAG and many data and products are available, including indices, data, plots, movies and special magnetic events. Both "low-fidelity" (one minute) and "high-fidelity" (one-second) data are available. Data are selectable by time-range and area.

SuperMAG are most interested in the high frequency component of magnetic data and seem to prioritise data quantity over data quality. SuperMAG process data and correct obvious errors but there is no specific indicator on data quality included in the system. Data are rotated into a magnetic coordinate system and are therefore different from the INTERMAGNET data in XYZ components.

SuperMAG facilitate easy access to data for a particular event and can be considered more as a processing tool with plotting/animation and dataset integration capabilities rather than a data repository. The data distribution is geared towards bulk data downloads. There are clear instructions for acknowledging and citing data on the SuperMAG web site.

The SuperMAG steering committee is chaired by JM and includes about 6 people representing data providers, including AT for INTERMAGNET. Other members on the committee represent data users and also SuperMAG itself. The committee was recently reformed and meets regularly to provide guidance and support.

Comments following this presentation concentrated on the memorandum of understanding (MOU) between INTERMAGNET and SuperMAG. The INTERMAGNET MOU is old and mentions only one-minute

data. There was agreement from the meeting that the MOU needs to be revised. SuperMAG have MOUs with all their data providers and are open to revising the MOU with INTERMAGNET.

CB noted SuperMAG take all data from the INTERMAGNET ftp site. Download statistics from the INTERMAGNET site are publicly available from <ftp://seismo.nrcan.gc.ca/intermagnet.stats/> while statistics from the SuperMAG site are available to data providers with username/password access. JM suggested INTERMAGNET should have login credentials to allow monitoring of download statistics from the SuperMAG site.

K. Elger noted that INTERMAGNET DOIs should be cited by SuperMAG and the DOI should really be included in all data file headers when data are downloaded.

AT reported on EXCON's discussions on SuperMAG during this meeting and expressed concerns how SuperMAG represents INTERMAGNET on their web site.

SuperMAG add value to the data and have influence within the space weather community but they are essentially a repository dependent upon data provided from other organisations and networks.

INTERMAGNET has influence through the SuperMAG steering committee and may request some changes to the site to ensure data ownership and provider details are clear.

At the end of this presentation, JM presented on the Mesospheric Optical Magnetometry project, a collaboration between University of Tromso and GFZ.

7.12 Comparison of 2014 one-minute and one-second data (HT)

A report on comparison between one minute and one second data.

In 2014 120 IMOs submitted one-minute definitive data and 71 IMOs submitted one-second data (either variation, provisional or quasi-definitive). 16 IMOs provided one-second data for the entire year – most of these IMOS were from North America and France. These 16 IMOs were chosen for the comparison study.

The comparison was made by calculating the difference between definitive one-minute data and one-second spot-value data sampled on-the-minute without any filtering.

Results show some observatories exhibit a bias between the one minute and one-second data, probably due to baseline adjustments between variation or quasi-definitive data and definitive data. Differences of daily and monthly means were also compared and plotted with error bars representing one standard deviation.

DB suggested the method of comparing one-minute data with spot-values of the one-second data is effectively comparing two different data sets and differences mainly reflect baseline updates between the two data sets and natural variability in high-frequency content of the data.

GH noted it is very important to have information on the instrumentation used to record one-minute and one-second data and whether the two data sets are recorded by the same or different instruments.

7.13 Proposal from Kakioka observatory (S. Asari)

An introduction to Kakioka magnetic observatory and a proposal for increased international engagement.

Kakioka magnetic observatory is part of the Japanese Meteorological Agency and has more than 100 years of operation and high-quality data. Kakioka observatory manages three IMOs and contributes to the Dst index. The observatory has about 30 skilled staff and runs proton vector magnetometers and fluxgate variometers for 10 Hz data. The 100 kg Japanese national standard theodolite is hosted at the observatory and has been running since 1972. Kakioka also hosted the IAGA geomagnetism workshop in 2004.

As Kakioka observatory is a government agency it benefits from official legal protection of a 35 km radius zone free from DC railways systems but must also negotiate significant bureaucracy which can act to slow the process of establishing new projects and international cooperation.

Kakioka proposes to increase international engagement in geomagnetism by volunteering to join the INTERMAGNET definitive data checking group. There are other examples of international co-operation within JMA but in order to get government approval Kakioka requires documentation from INTERMAGNET.

It is suggested a change of name for definitive data checkers and observers at INTERMAGNET meetings would be helpful to the process of requesting Japanese government approval for Kakioka to participate more actively in the international geomagnetic community. A name such as “Definitive Data Checking Task Team” and “delegate” rather than observer/guest at meetings would be more favourable.

The requests will be considered further in DD.

7.14 NanoMagSat (GH)

An update on the absolute scalar magnetometer for satellite magnetic field monitoring and a new proposal for ESA.

Each of the Swarm constellation satellites run an absolute scalar magnetometer (ASM) at the tip of a boom about 2 m from the star cameras. The ASM was designed and built in France to measure scalar magnetic field data at 1 kHz and incorporates coils which allow self-calibration and measuring 1 Hz vector and scalar data.

The instrument has been proven suitable for high quality monitoring of the geomagnetic field, secular variation and secular acceleration. 250 Hz vector data, available when the coils are switched off, have also been proved useful to measure higher frequency magnetic phenomena such as whistlers to provide information on the state of the ionosphere.

Since launching on Swarm there have been improvements to the instrument for lower noise, smaller size and hopefully less cost. Launching such an instrument on a nanosatellite at 500 km elevation with a 60 inclined orbit will allow collection of magnetic data with rapid progression in local time and fast global coverage.

The European Space Agency has issued a call for proposals, including design, launch and operation of nanosatellites projects with both scientific and non-scientific applications. Total available funds are 30 million Euro. A proposal is being developed with industry (Open Cosmos Ltd) for a cube satellite carrying an ASM, GPS, Langmuir probe and 1 kHz vector magnetometer.

There is an opportunity for the community to set standards for nanosatellites and this could involve INTERMAGNET. A letter from INTERMAGNET has been requested to indicate the community will be interested in magnetic data produced by the proposed project.

7.15 Canadian variometer networks (G. Jansen Van Beek)

Description of magnetic variometer installations at Canadian electricity network transformer sites and a proposal to list variation sites on the INTERMAGNET web site.

The Canadian electricity company, Ontario Hydro, are establishing magnetic variometer instrumentation at six electricity transformer sites to study geomagnetically induced currents in the network. Bartington vector magnetometer sensors have been installed in purpose-built vaults about 100 m from the transformer sites. Each of the magnetometer sensors are aligned carefully with azimuth determinations and initial absolute observations. Data availability from these stations will be at the discretion of Ontario Hydro.

There is also a variation station network in Manitoba called the CARISMA network run by the University of Alberta.

The presentation suggested a proposal to INTERMAGNET that details and contact information for high quality data available from variometer sites such as the Ontario Hydro stations could be included on the INTERMAGNET website. Information and data from these sites may be of interested to researchers using INTERMAGNET data.

DB noted there are a number of other similar non-IMO observatories and variation stations around the world which could be included in this proposal.

7.16 Vale Ole Rasmussen (JRD)

Dr Ole Rasmussen passed away on 28 February 2018. Ole’s long and significant contribution to INTERMAGNET and the geomagnetic community was honoured through a summary of his career and a number of photographs. A moment’s silence was observed in memory of Dr Rasmussen.

8 Next meeting

An offer has been received from Kazan, Russia to host the next meeting, either before or after the IAGA INTERMAGNET workshop (6 – 12 July 2020). This offer was accepted and details will be finalised later. There is also an offer from the geomagnetic group from Hyderabad, India to host an INTERMAGNET meeting in association with the IAGA/IASPEI scientific assembly in 2021.

9 Closing

SF closed the meeting and offered thanks to NRCan and BSL for hosting and arranging this meeting. Subcommittee chairs and secretary were thanked with particularly acknowledgement to CT for his additional work as acting chair of TM. AT expressed thanks to SF on behalf of everyone for his work organising and chairing the meeting.

10 Decisions and action items following the Ottawa meeting

10.1 Decisions

Number	Description
P.D19.1	The next meeting will be hosted by Kazan Observatory Russia in July 2020
P.D19.2	One-minute definitive data for 2016 and onwards will be published annually on-line as an “INTERMAGNET Reference Data Set” which will include all available previous data (from 1991) with any errata applied. The annual data sets will be citable with a DOI.

10.2 Action items

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

Number	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 recommendations on targeted invitations by 10 weeks before the next meeting
P.A12	AT	Invite IAGA secretary-general (or other suitable representative) to attend next meeting
P.A13	SF	Commence arrangements for the next meeting with the local host by 10 weeks before the next meeting
P.A14	SF	Finalise the list of attendees and resolve any non-attendance issues 6 weeks before the next meeting
P.A15	SF	Request committee members for agenda items for inclusion at the next meeting and request chairs to create subcommittee agendas
P.A16	SF	Include item on next meeting agenda to seek views on effectiveness of INTERMAGNET’s communication with community
P.A17	SF	Announce INTERMAGNET meetings on worldobs mailing list
P.A18	AT	Arrange an INTERMAGNET discussion session during the next IAGA observatories workshop
P.A19	SF	Publish draft agendas 2 weeks before the next INTERMAGNET meeting
P.A20	SF/AM	Publish new version of IMCDView and data conversion software onto GitHub
P.A21	SF	Generate metadata reports and provide via email to IMOs (in WDC call-for-data) asking for correction and feedback
P.A22	SF/K.Elger/BH/JRD	Prepare metadata and publish DOI for 2014 data
P.A23	SF/K.Elger /BH/JRD	Prepare metadata and DOI for 2015 data release (1991-2015)
P.A24	SF/K.Elger /BH/JRD	Commence preparation on metadata and DOI for 2016 INTERMAGNET Reference Data Set (IRDS-2016) 1991 – 2016
P.A25	AL	Make Quasi-Definitive comparison software available on GitHub
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
P.A27	AT/GH	INTERMAGNET letter of support for nanoMagsat

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
P.A29	Committee/community	Inspect “intermagnet.github.io” and provide feedback on style and content to CB
P.A30	Committee/community	Create a github account – email link to be provided by CB

11 Executive Council

Participants

EXCON Members: David Boteler, Gauthier Hulot, Alan Thomson

Guests: Kristen Lewis, Jeffrey Love

11.1 Agenda

- Report on progress on EXCON Vienna 2018 Action Items
 - Follow-up on any relevant items
- Discussion Potentially Leading to Decisions
 - Status & discussion on new INTERMAGNET web service host
 - SuperMAG request for 1-second data (J. Gjerloev – email of 9th April)
- General Discussion & Information Exchange
 - Status of EXCON
 - Status of OPSCOM subcommittees and activities
 - Progress on definitive 1-minute data
 - Progress on 1-second data
 - Progress on the Technical Manual
 - Progress on DOIs and data licensing
 - Discussion on ways forward for INTERMAGNET
 - New science opportunities
 - MAGQUEST
 - Nanomagsat
 - Communication
 - Scope for advertising INTERMAGNET via ...?
 - Use of Wikipedia, message board, social media?
 - ‘25 years of IM data’ paper for EOS
 - Updates on and links to external organisations (Earth science and space weather related)
 - e.g. EPOS, OSCAR-WMO, UN-COPUOS, ...
 - Any Other Items from EXCON members

11.2 Review of action items from Vienna, 2018

Number	Description	Status
EXC.A1-2018	web service and archive host	EXCON supports the OPSCOM approach outlined in plenary session, in investigating separating the web service and data archive and having a test period of operations, over about one year, at both Hyderabad and at BGS to help define an optimum solution for the future of both of these activities.
EXC.A7-2018	review of geophysical monitoring at IMOs	Progress on this had been halted by exit from USGS of a student who developed the draft web-form with C. Finn. J. Love will investigate the current status of the web-form with a view to EXCON then issuing the form, probably largely in

		its present state, to the IMO community, primarily to assess what is being done in the areas of geo-electric and search coil measurements. EXCON remains interested in whether there is a future role for standards-setting in these areas, not least because of the growth in interest in hazardous geo-electric fields. This AI has therefore been re-stated as EXC.A1 for 2019 .
EXC.A9-2018	“25 years of INTERMAGNET data” paper for EOS magazine	AT will lead the drafting of this with support from EXCON colleagues and J. Love.

An open discussion was held on INTERMAGNET’s legal position in respect of liability, for example from loss of IMO status affecting previously affiliated institutes. This followed a similar discussion last year and has resulted in **EXC.A2 for 2019**. The main points arising from the discussion were the need for clarity, on the web site and in documents, with appropriate disclaimers and explicit recognition by applicants of the terms and conditions (and consequences) of membership.

11.3 Discussion potentially leading to decisions

The relationship between SuperMAG and INTERMAGNET was reviewed. EXCON considered how data providers are portrayed on the SuperMAG website (noting that SuperMAG is more of a database than a genuine network of collaborating institutes). EXCON felt that more credit ought to be provided to the SuperMAG data originators: a superficial look at the SuperMAG website might lead a reader, or funder, to conclude that SuperMAG either measures or otherwise procures these data. On data citing, EXCON felt that it is important to cite the data originator, not just the repository or download source, such as SuperMAG. The request for 1-second data to compute pulsation activity indices was also discussed and agreed with, with the proviso that SuperMAG should not release 1-second data to enquirers, rather refer enquiries back to the data originators, as the authoritative source. This led to **EXC.D19.1** and **EXC.A3**.

INTERMAGNET membership has traditionally been from government-supported and academic institutes. However, after discussion, there was no objection in principle to applications from non-public-sector bodies, citizens and businesses. It was recognised, however, that INTERMAGNET-standard expertise is likely to be found in existing national geomagnetism programs and that such agencies/institutes/individuals should be an initial point of contact for all interested parties. This discussion led to **EXC.D19.2**.

11.4 General discussion & information exchange

EXCON took the opportunity to review how subcommittees and activities were progressing, following the plenary reports made the previous day. Various comments on these activities are noted below.

- Status of EXCON
 - EXCON discussions are positive, lively and constructive and are most effective when meetings are attended by all members. No change in working practises are seen to be required at the present time.
- Status of OPSCOM subcommittees and activities – *feedback to OPSCOM committees*
 - Progress on definitive 1-minute data
 - Progressing well

- Progress on 1-second data
 - EXCON requests institutes to provide additional data checkers: some concern was expressed that a lot of effort falls all on Jan Reda to complete, and that was a burden that ought to be shared more widely
 - **EXC.A5.** Excon welcomes Kakioka's involvement in data checking
 - Information from OPSCOM for clarification would be welcome on:
 - What is being checked, and to what level of detail?
 - Spikes, steps or something else?
 - What tools are being used for data checking?
 - What is the scope for research into AI and machine learning to help develop new tools?
 - Is the data considered variational or definitive (i.e. stable baseline) – where are we headed?
 - If no-one is yet clearly meeting the 1-sec standard – what are the specific problems at this time, and do we need to revise/review the standard to keep it relevant?
 - Archiving of variational and provisional data – keeping all data is recommended at this time
- Progress on the Technical Manual
 - Discussion leading to **EXC.A6.** EXCON recommends that the TM committee complete V5.0.0 this year and devise a roadmap for V6:
 - As a suggestion, this could be annual, or bi-annual updates designated 5.1, 5.2... (where appropriate) with major revision 6.0 introduced after 5 years, perhaps aligned with some other major milestone in Geomagnetism, e.g. the IGRF revision
 - EXCON wish to record their appreciation of Benoit St-Louis and all contributors to the TM v5.0. This has been a major undertaking.
- Progress on DOIs and data licensing
 - Progressing well
- EXCON discussed the use of interim online/telecon meetings between annual meetings and concluded that the subcommittees were using this opportunity as and when needed
- EXCON also discussed the website and felt that a refresh of some kind was needed, partly reflecting changing styles, as well as recent major developments in 1-second data, Technical Manual, etc. This led to **EXC.A4.** It was felt that a website review with input from the wider “user community” could be a worthwhile activity. Some commented that it could be hard to find the real-time data and carry out bulk data down-loads
- Discussion on ways forward for INTERMAGNET
 - New science opportunities
 - MAGQUEST (USA)

- EXCON will be happy to support individual institute activities under this project (scope of project: how to continue global field measurements when ESA-Swarm ends, to support development of the World Magnetic Model)
 - Nanomagsat (France, Europe)
 - AT will write a letter of support on behalf of INTERMAGNET
 - EXCON believes that INTERMAGNET needs to keep abreast of developments in satellite magnetometry and share knowledge and best practise
- Communication
 - Scope for advertising INTERMAGNET via ...?
 - Communication via meetings and other means remains a standing item. There had been several INTERMAGNET updates at the IUGG meeting, as well as a poster detailing major INTERMAGNET activities in the last couple of years
 - Use of Wikipedia, message board, social media?
 - ‘25 years of IM data’ paper for EOS
 - See **EXC.A9** from 2018
 - Updates on and links to external organisations (Earth science and space weather related)
 - e.g. EPOS, OSCAR-WMO, UN-COPUOS, ...
 - As under ‘communication’ above, EXCON agree to seek ways to influence international activities, particularly around solid Earth and space weather uses and users of geomagnetic data
- Any Other Items from EXCON members
 - Following the SuperMAG discussion, EXCON considered whether there is scope for INTERMAGNET’s involvement in the long-term hosting and standard-setting for variometer data, for example, where such instruments/networks are long-term, not ad hoc, and with some control on stability, orientation and location. This could be on a different ‘channel’ on the INTERMAGNET website and archive, with a different set of ‘rules’
 - DB will develop a concept note on this topic

11.5 Decision and action items from Ottawa meeting

11.5.1 Decisions

Number	Description
EXC.D19.1	<i>SuperMAG 1-second data request:</i> INTERMAGNET agrees to the SuperMAG request for permission to download 1-second data to compute pulsation activity indices. SuperMAG should however pass any requests they receive from their user group for 1-sec INTERMAGNET data back to INTERMAGNET/data-originators as the authoritative

	source of these data. SuperMAG should not distribute 1-second data from INTERMAGNET observatories.
EXC.D19.2	<i>Membership for commercial and non-public sector entities operating magnetic observatories:</i> Although government agencies and public-sector institutes traditionally operate magnetic observatories, INTERMAGNET has no issue in principle with other entities who operate magnetic observatories, including commercial businesses, applying for INTERMAGNET status. We do however require that any such applicants liaise with any national geomagnetic program, as national experts, to advise on all technical issues in setting up an observatory to INTERMAGNET standards.

11.5.2 Action items

Number	Responsible	Description
EXC.A1	EXCON, J.Love	<i>Co-located instruments review:</i> A web-form was drafted by USGS, to implement EXC.A7 from 2018, intended to survey other geophysical monitoring carried out at IMO facilities. JL will liaise with USGS colleagues on the present state of the web-form and Excon will then issue the web-form as is and take stock of the results received. The initial focus will be on any electric field and higher frequency measurements, with the motivation here being the possible future development of standards in these areas by INTERMAGNET. This will complete EXC.A7 from 2018.
EXC.A2	EXCON; IMO, TM committees	<i>Liabilities for data (mis)use and IMO status removal: amendments to application form and technical manual:</i> 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.
EXC.A3	AT, JM, OPSCOM	<i>Update relationship with SuperMAG:</i> We will engage constructively with SuperMAG, through the SuperMAG international steering committee, to reflect better the relationship, roles and services respectively of SuperMAG and INTERMAGNET for geomagnetic data users. The Memorandum of Understanding with SuperMAG therefore needs updating, partly also to reflect EXC.D19.1. AT will reply to SuperMAG on EXC.D19.1 and OPSCOM will support implementation of EXC.D19.1 where necessary. We will issue a guest invite to J. Gjerloev, as lead PI for SuperMAG, for the next INTERMAGNET meeting.
EXC.A4	OPSCOM	<i>INTERMAGNET website review by user community:</i> It seems timely to consider how our website looks and feels to users. This view is also partly prompted by comments by some users in having difficulty in finding real-time data and in bulk downloading of data.

EXC.A5	OPSCOM	<i>INTERMAGNET invites Kakioka to join the data checking team:</i> Applications to join the INTERMAGNET data checking team are welcome and we will work with all applicants to help with any administrative issues for each institute who wish to join the team. We therefore very much welcome Kakioka's offer to assist and look forward to their active participation in the data checking team
EXC.A6	BSL, TM committee, SF	<i>Technical Manual v5.0.0:</i> We encourage the TM committee to complete, issue and advertise the Technical Manual V5.0.0 this year and devise a roadmap towards V6.0.0

12 Definitive Data Subcommittee

Participants

Committee Members:

Charles Blais (member of DD), Stephan Bracke (OPSCOM), Simon Flower (DD), Benoit Heumez (DD), Sergey Khomutov [via Internet](DD), Roman Leonhardt (DD), Virginie Maury [via Internet] (DD), Tero Raita [via Internet] (DD), Jan Reda (chair of DD), Hiroaki Toh (DD)

Guests:

Seiki Asari (Kakioka), David Calp (GSC), Ellen Clarke (BGS), Kirsten Elger (GFZ), Jeremy Fee (USGS), Achim Morschhauser (GFZ)

12.1 Agenda

- A review of progress on actions items from Vienna Meeting 2018.
- Reports on the 1-min and 1-sec Definitive Data collection.
- Status of publication USB 2015.
- Cross-checking 1-min and 1-sec definitive
- The way forward for 1-second data checking.
- Reported problems with cross-checking of 1-min definitive.
- Publication of 1-min definitive data sets from 2016 onwards.
- The proposal from Kakioka: establishing of CROSS-CHECKING TASK TEAM and making this public.
- Calculation of minute means and annual means, how to treat past, present and future non-compliance
- Issues related to yearmean files and IYFV1.01 format
- What Incomplete flag in the IYF format means?
- Clarification related Longitude in the block header of yearmean file
- DD Subcommittee Action Items following the Ottawa Meeting 2019

12.2 Review of action items from Vienna, 2018

Number	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	Started needs further work before being publicized Received Version 0.2 document from TR, updated by BH for 1min data. 1sec data guide to be done after.
DD.2	JRD	Sending CALL FOR ONE-MINUTE DEFINITIVE DATA FOR 2018 by end of January 2019. Deadline for data submission is July 1st, 2019. (NO country files!)	Done Sent to IMOs 2019-02-14. During Vienna meeting it was said that country files will not be published 2016 onwards (after CD/DVD/USB era) Despite this in CALL FOR 1-MIN DATA IMOs will be still asked to provide country files
DD.3	JRD	Sending CALL FOR ONE-SECOND DEFINITIVE DATA	Done Sent to IMOs 2019-03-04

		FOR 2017 – February 2019. Deadline for data submission is October 1st, 2019	
DD.4	JRD	Compilation of data for USB drive 1991-2015	Done (compiled all IAF and metadata files) 1. In the USB will be link to all versions of IMCDVIEW Java browsers, on USB2015 there will be no installation software 2. Cover design is underway
DD.5	BH	Production and distribution of USBs 1991-2015	Very advanced 1. Cover design to be finalised 2. Waiting for decision regarding software
DD.6	VM	Preparation of Paris ftp server for both stages (STEP1: proposed data; STEP2: validated data by cross-checker) of the 1-sec definitive data collection (independent logins and passwords similar to 1-min definitive data)	Done
DD.7	SF	Continuation of work related to Java software (DataCheck1s, gmconvert)	Done Since the Vienna Meeting the following version of IMCDVIEW were released: 1.9, 1.91, 1.92, 1.93
DD.8	RL	Continue to develop MagPy software	Done MagPy is continually under development
DD.9	HT	Investigate comparison of 1-sec definitive with 1-min definitive data	Done Preliminary results of comparison were presented by HT 1-st day in Ottawa
DD.10	CB	Preparing a place on Intermagnet ftp server for online publication of Definitive Data 2016 onwards	Out of date due the fact that Definitive Data 2016 onwards will be published as DOI on GFZ

12.3 Reports on the 1-min and 1-sec definitive data collection.

12.3.1 Report of 1-min definitive data collection

Year	IMOs Received Step1	Cross checked Step2	Accepted on INTERMAGNET Web	Comments
2015			117	Status at 2019-07-08 Finally compiled for USB2015
2016	114	109	109	Status at 2019-07-08
2017	107	92	92	Status at 2019-07-08

2018	70	19	18	Status at 2019-07-08. One week after deadline
------	----	----	----	--

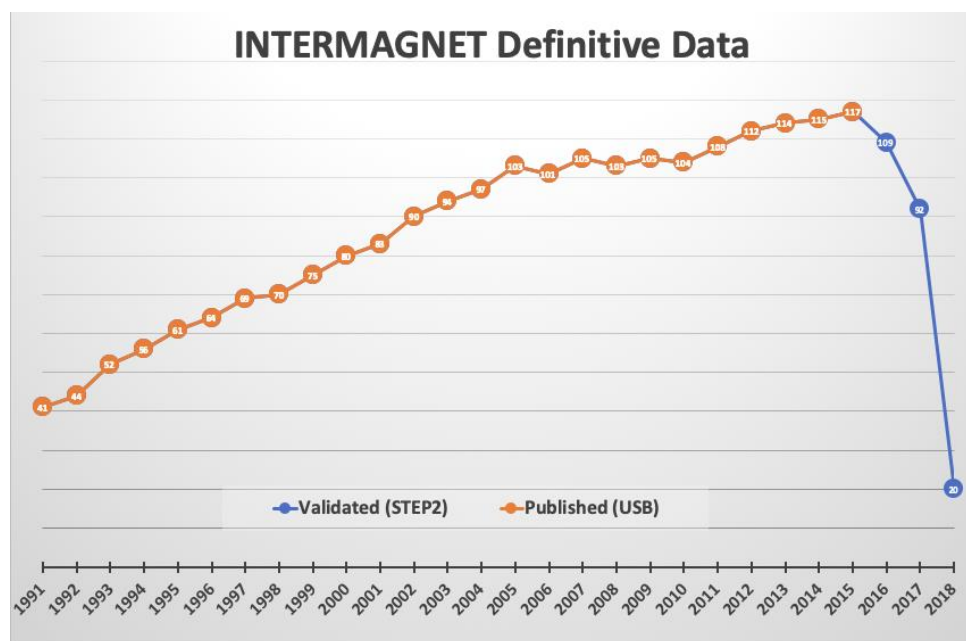
12.3.2 Report of 1-sec definitive data collection

Year	Provided	Accepted	Comment
2014	38	36	Status at 2019-07-08
2015	36	12	Status at 2019-07-08 (USGS only)
2016	36	11	Status at 2019-07-08 (USGS only)
2017	7	0	Status at 2019-07-08 (ABK, BDV, EBR, LYC, TUC, UPS, WIC)
2018	4	0	Status at 2019-07-08 (ABK, LYC, UPS, WIC)

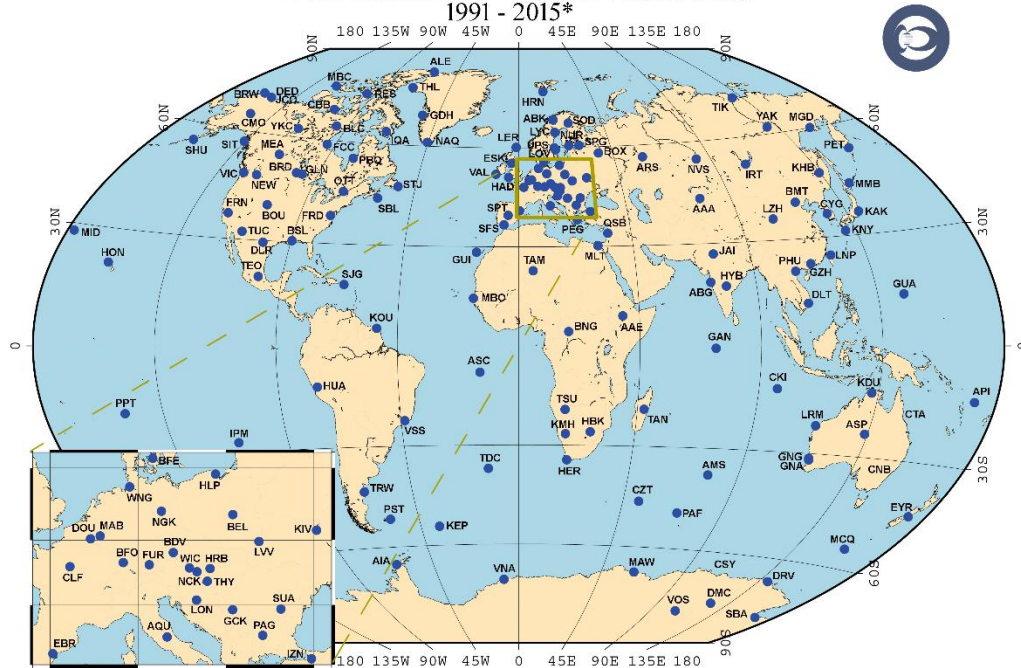
12.4 Status of publication USB 2015

Compilation of USB 2015 is complete. USB 2015 includes 2015 1-min definitive data and updated 1991 to 2014 data, together 25 years of one-minute definitive data including meta-data files. It is the last USB publication, from 2016 onwards, 1-minute definitive data sets will be published online.

Year	IMOs
1991	41
1992	44
1993	52
1994	56
1995	61
1996	64
1997	69
1998	70
1999	75
2000	80
2001	83
2002	90
2003	94
2004	97
2005	103
2006	101
2007	105
2008	103
2009	105
2010	104
2011	108
2012	112
2013	114
2014	115
2015	117



INTERMAGNET Observatories 1991 - 2015*



* This map shows all IMO's that contributed their one-minute Definitive Data in the period 1991-2015 (state of Jan 2019)

The map of IMO's whose definitive data (1991 to 2015) are on USB2015 (144 IMO's)

Some files on the USB 2015 are different than those originally published on CDs/DVDs. The total number of new files (provided again or provided for the first time) is about 600. This is about 1.5% of all files. The main works undertaken in connection with preparation of USB 2015 were as follows:

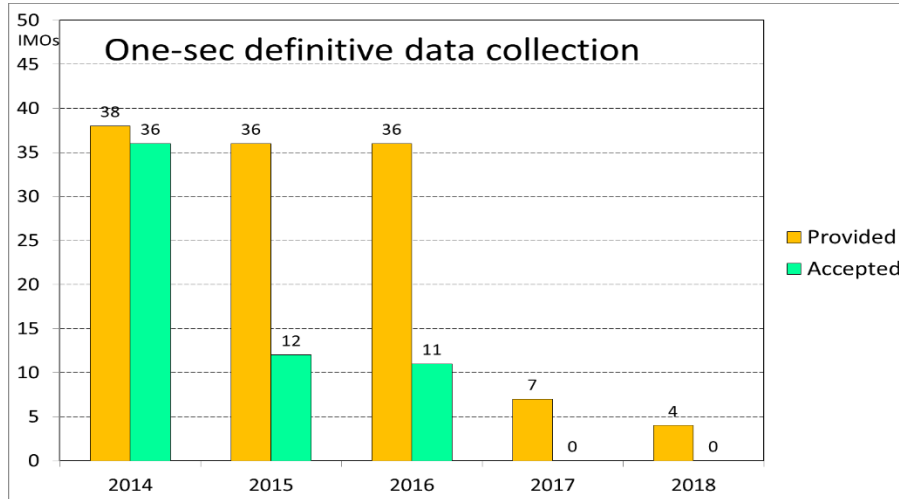
- Compilation of IAF files downloaded from INTERMAGNET web (the most recent one-minute files) and metadata files earlier published on CDs or DVDs or USB
- Cover design
- Updating of Java browser imcdview1.93.jar will be added on USB 2015

It is worth noting that USB 2015 will not include the IMCDView installer, but instead a link to the INTERMAGNET software page will be on the jacket (<http://intermagnet.org/publication-software/software-eng.php>)

12.5 Cross-checking 1-min and 1-sec definitive

12.5.1 one-second definitive data checking

The summary of the current state of 1-sec definitive data collection is presented in the figure below:



The comparison of control systems for 1-min and 1-sec definitive data is shown in the table below:

	One Minute	One Second
Additional files required	yearmean.imo imoyyyy.blv readme.imo readme country country/institute map about screen	No additional files required
Software for data control	Java browser IMCDVIEW (still developed for over 15 years) Check1min.exe MagPy	Autoplot, gm_convert, MagPy DataCheck1s.jar (for IAGA 2002) iaga2002_to_iaf21.exe (for IAGA 2002)
Where are available accepted definitive data?	1-min data are publicly available on INTERMAGNET web	1-sec data are stored on Paris ftp server/step2 only available for those knowing the login and password to step2.
Checking definitive data	Two-stage cross checking system In 1st stage, definitive sets are checked by volunteer data checkers. In 2nd stage, data is checked by the chair of DD subcommittee,	There is no set protocol for the review of 1-sec data. So far 1-min definitive are checked by chair of DD The accepted data is not stamped nor copied to INTERMAGNET web. So far, only 1-sec data provided in IAGA 2002 were checked.

	if accepted it is stamped and transferred to INTERMAGNET web.	There is no tool available to check CDF 1-sec data format.
--	---	--

Main problems to be solved:

- Creation of a data checking protocol for 1-sec data, similar to 1-min data
- Finding people who will have time for such activity

There were no practical suggestions in Ottawa to overcome this situation.

12.5.2 Reported problems with cross-checking of 1-min definitive by TR

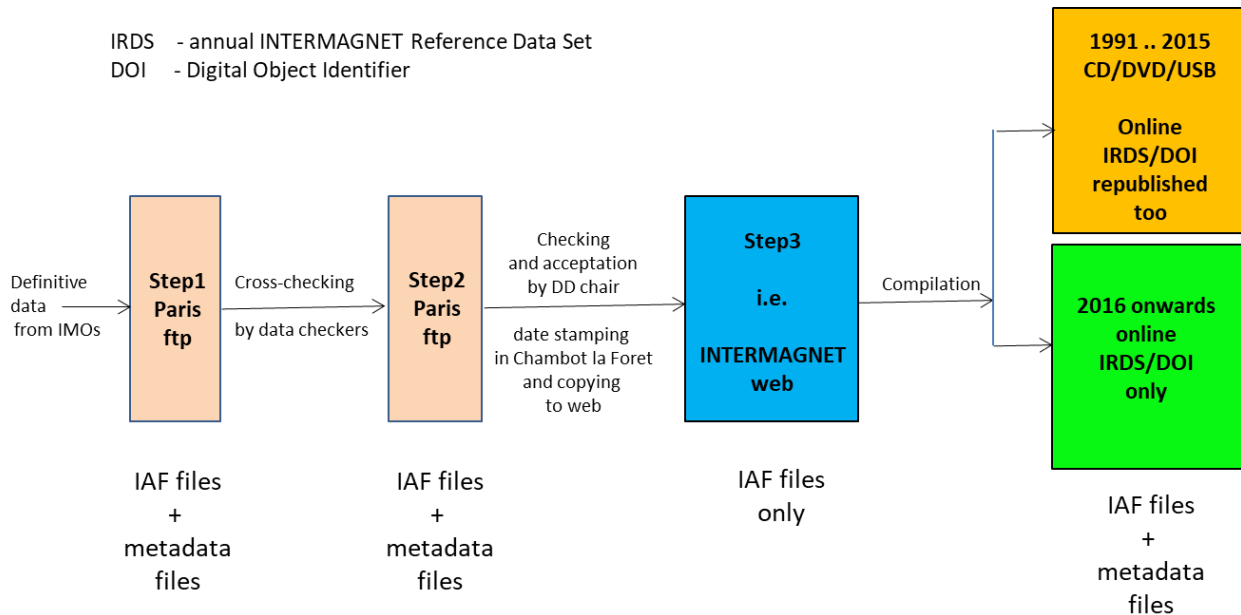
This section has been removed from this public copy of the minutes as it contained discussions about individuals, observatories and institutes.

12.6 Publication of 1-min definitive data sets from 2016 onwards

The discussion focused on the issue of publishing online all INTERMAGNET Reference Data Set (IRDS). There were doubts on how corrections, changes or definitive data provided after dead-line will be published. Such situations were explained by SF and K.Elger. It will be possible and will comply with DOI rules. The table below shows where 1-min definitive data are available and characterizes these mediums.

Medium or Place	Remarks	Allowed CHANGES
CD/DVD/USB	IAF files Both observatory and country/institute metadata files	No (physically impossible for CD/DVD)
Publishing on INTERMAGNET web	1-min files only (both IAF and IAGA2002) No metadata files	Yes
INTERMAGNET web 2016 onwards	IAF files Both observatory and country/institute files Directory structure exactly the same as for CD/DVD/USB	Yes (corrections and late submissions will be published in the following edition of the data set)
Annual INTERMAGNET Reference Data Set (IRDS)	IAF files Both observatory and country/institute metadata files Each IRDS will be assigned a DOI.	No (secured with control sum). Updated when new data are published without any changes to previously published data
Step1 Paris ftp server	Internal working place available for IMOs, data checkers, and INTERMAGNET officers	Yes
Step2 Paris ftp server	Internal working place available for data checkers, and INTERMAGNET officers	Yes

The figure below shows the path from Definitive Data provided by IMOs to annual INTERMAGNET Reference Data Set (IRDS)



12.7 Proposal from Kakioka: establishing of cross-checking task team and making this public

The proposal of Koizumi Takeshi, Director of Kakioka Magnetic Observatory, was discussed. This proposal aimed to establish a CROSS-CHECKING TASK TEAM.

At the INTERMAGNET Meeting in Tokyo (about 15 years ago) it was decided to share the tasks of collecting and checking the definitive data sets among several colleagues.

In 2004, all definitive data were divided in 8 groups. There are now 12 groups. A volunteer is responsible for the control of data of a given group of IMOs. The volunteers come from IMOs or organizations that run INTERMAGNET observatories. This work is often called CROSS-CHECKING.

There is a long list of things that are controlled during cross-checking. The most important of them are the following:

- meeting the quality criteria of definitive data required by INTERMAGNET,
- checking if provided files fulfil criteria of compliance with INTERMAGNET data formats,
- checking of metadata provided together with time series, among other things, the detection of discrepancies in metadata such as geographical coordinates in different files

Cross-checking is highly valuable, it:

- Helps to ensure high-quality provided definitive data sets,
- Contributes to the integration of persons, observatories, and organizations involved in geomagnetic observations

It is worth mentioning that the valuable work of data-checkers is carried out in an informal way. Data-checker's institutions are not always aware that such hard work is realized by their employees. From the point of view of these institutions, it can be seen as engaging employee potential at work that does not bring benefits. Parent organizations of data-checkers should at least officially know their employees work as experts for the prestigious INTERMAGNET network.

From the director of Kakioka Observatory comes the proposal to establish an official CROSS-CHECKING TASK TEAM. Such a team would be supervised by the Definitive Data Subcommittee. The team would be known to the public. On the INTERMAGNET website, both names of team members and their tasks

would be mentioned. A description of the benefits given by such work for observatories and institutions whose employees work in CROSS-CHECKING TASK TEAM should be added.

The proposal from Koizumi Takeshi, Director of Kakioka Observatory of establishing a CROSS-CHECKING TASK TEAM and making this public was warmly received by DD Subcommittee. We therefore recommend to EXCON to accept this proposal:

publish both names of members and their tasks on the INTERMAGNET website. The benefits it brings to observatories or institutions whose employees work in CROSS-CHECKING TASK TEAM should be also added to the website.

SK: I think that a solution may be to send an official letter from EXCON to the checker's institute or higher-level organization. A second solution is to include details of the checker in the IMOs definitive data metadata files, maybe in the form of an acknowledgement in readme.IMO. This is similar to acknowledging a reviewer of a publication, especially since the checker is not anonymous.

12.8 Calculation of minute means and annual means, how to treat past, present and future non-compliance

Not all observatories calculate mean values according to INTERMAGNET rules. Until recently it seemed that this case concerned mainly hourly, daily and yearly mean values. It is a surprise to all of us that some observatories incorrectly calculated minute values too. Both INTERMAGNET and IAGA requires one-minute means to be centred on the minute (mm:00). In addition, INTERMAGNET requires digital filtering and provides recommendations for Gaussian filter coefficients. Unfortunately, some observatories centre minute means on mm.30 (middle of the minute). There are also in this group IMOs which declared in "INTERMAGNET MEMBERSHIP APPLICATION FORM" that digital filtering conforms to INTERMAGNET specifications.

This topic was discussed in detail by IMO Applications Subcommittee. The DD subcommittee will wait for IMO Applications subcommittee propositions to overcome this situation and enforce the decision on the delivery of definitive data in the future.

12.9 Issues related to yearmean files and IYFV1.01 format

The IYFV1.01 format description and problems to this format are presented in the table below:

Text on Web	Remarks
<p>Magnetic data with 1nT or 0.1min of arc resolution are organized on a year file basis. One file contains all published annual mean values of the geomagnetic field components at a single observatory.</p> <p>File name: YEARMEAN and the three-letter observatory ID code as an extension. eg: YEARMEAN.BOU for Boulder.</p> <p>Each file may have from 1 to 3 tables containing annual mean values. The file must contain a table of annual means for ALL-DAYS, but may also contain tables of annual means for QUIET-DAYS and DISTURBED-DAYS.</p>	<p>Maybe it is worth to add that it is possible to publish annual means from the beginning of observatory operation (JRD)</p>
<p>Description of the bloc header</p> <p>The header contains information on observatory name, ID-code, Colatitude, Longitude and Elevation. It further contains the headers for each data columns. See Sample of IYFV1.01 CD-ROM/DVD yearmean file for an example.</p>	<p>AL email of 2019-06-28: When checking VSS-2013 in Oct 2018 we had an issue with longitude E and longitude W in "yearmean.vss" file and realised the yearmean file format</p>

	<p>description is not specific about using longitude E or longitude W. Maybe we could discuss this issue during the Ottawa meeting and update the yearmean file format description to specify longitude E to be consistent with IAF format description?</p>
<p>Description of data space (75 characters per line including CrLf) All data fields are right-justified. The field width must be maintained, either by zero-filling or space-filling. The '+' sign for positive values is optional.</p> <pre>YYYY.yyy_DDD_dd.d_III_ii.i_HHHHHH_XXXXXX_YYYYYY_ZZZZZZ_ FFFFF_A_EEEE_NNNCrLf</pre>	<p>Data providers have sometimes problems with linefeed characters, because CrLf is typical for Windows software only. Lf – typical for Linux/Unix. Cr – typical for Mac Do we need to set a limit of “75 characters”?</p>
<p>YYYY.yyy Epoch is given with 3 decimals.</p>	
<p>DDD_dd.d Declination is given in degrees and decimal minutes of arc.</p>	<p>Eventual sign “-” should be before degrees only. Correct examples: -1 04.1 -0 02.6 Incorrect example: -0 -2.6 Acceptable both 0-360 E and ± angular value</p>
<p>III_ii.i Inclination is given in degrees and decimal minutes of arc.</p>	<p>Remarks as above</p>
<p>HHHHHH H-component is given in nT.</p>	
<p>XXXXXX X-component is given in nT.</p>	
<p>YYYYYY Y-component is given in nT.</p>	
<p>ZZZZZ Z-component is given in nT.</p>	
<p>FFFFFF F-component is given in nT.</p>	<p>We don't know what annual F were provided, calculated from XYZ(HDZ) or averaged from scalar What about future? F calculated from XYZ (HDZ) or averaged from scalar ?</p>
<p>A Type of annual means. May be All, Quiet, Disturbed, Incomplete or Jump. The J is not an annual mean value, but indicates a jump in the observatory recordings, which should be described in a note.</p>	<p><u>CT, email of 2018-07-31:</u> The 'I' flag is noted but not defined in the IYFV1.01 Can the IYFV1.01 format be modified to clarify the meaning of the “I” - incomplete” flag? Looking back on the DVD, it seems that it has been applied to data that are <90% complete, presumably to allow these data to be used in the WDC. However, the flag could be interpreted as, 'the components are incomplete' or</p>

	<p>that the data are $\geq 90\%$ but $< 100\%$ complete.</p> <p><u>JRD, email of 2018-08-01</u></p> <p>We don't know how "I" was defined (<i>interpreted</i>) by IMO's in the past. One can suppose that each IMO defined "I" individually.</p> <p>Other problem is that "I" is indistinguishable for All, Quiet Disturbed days.</p>
EEEE recorded elements. eg:"XYZF" or "HDZF".	<p>Problem to be solved: How to distinguish total field calculated from XYZ(HDZ) vs. total field averaged from scalar</p> <p>Proposal: define element S for next version of IYF format.</p> <p>S – annual total field averaged from scalar</p> <p>F – annual total field calculated from annual means XYZ or HDZ</p> <p>Examples: XYZF – total field was calculated from XYZ HDZF – total field was calculated from HDZ XYZS – total field averaged from scalar HDZS – total field averaged from scalar</p>
NNN Note number	
Missing elements in an annual mean record should be represented with 9s. Missing angular values should be coded as three 9 digits, a space, two 9 digits a dot and one 9-digit: 999 99.9 Missing field strengths should be coded as six 9 digits: 999999	
Description of the footer At the end of the file is added a footer describing the data. The footer contains notes on jumps, incomplete data sets etc. See Sample of IYFV1.01 CD-ROM/DVD yearmean file for an example.	

12.10 Decisions and action items following the Ottawa meeting

12.10.1 Action items

Number	Responsible	Description
DD.A1	JRD	Sending CALL FOR ONE-MINUTE DEFINITIVE DATA FOR 2019 by end of January 2020. Deadline for data submission is July 1st, 2020.

DD.A2	JRD	Sending CALL FOR ONE-SECOND DEFINITIVE DATA FOR 2018 – February 2020. Deadline for data submission is October 1st, 2020.
DD.A3	JRD	Compilation of definitive data 2016, 2017.
DD.A4	HT	Comparison of one-minute values calculated from 1-sec definitive with one-minute definitive values reported in IAF files.
DD.A5	BH, TR, JRD	Complete the writing guidance how to check INTERMAGNET 1-minute definitive data.
DD.A6	JRD	Organizing an interim Internet meeting of Definitive Subcommittee on December or January.
DD.A7	RL	Preparation guidance how to use MagPy both as windows application and command line application for 1-sec data checking.
DD.A8	BH	Completion of USB cover project, production and distribution of USB2015 with 25 years of definitive data sets.
DD.A9	AL, CB	Publish details of the definitive data cross checking task teams on the INTERMAGNET web site and include the benefits to employers/institutes of team membership. (see also EXC.A5)
DD.A10	RL, BH, AL E. Clarke, S. Macmillan	Consider the IYVF format description to clarify a number of uncertainties in the format including amongst other things, the source of the total field (F) annual means, the form of longitude and the meaning of the “I” incomplete flag – at least one external data user should be included in the responsible group (suggest Susan Macmillan -BGS)
DD.A11	JRD	Notify all IMO’s of the requirement that minute means must be calculated to align to the start of each minute (hh:mm:00) and contact all data checkers to request they confirm definitive data comply with this requirement.

13 GINS/WWW and Data Formats Subcommittee

13.1 Agenda

- Future of the INTERMAGNET web
 - Application review
 - See how applications can be moved to GitHub and how to approach it
 - Applications include:
 - Data download
 - To discuss after broader discussion of the future of INTERMAGNET’s data
 - Metadata
 - Completed by CB using BGS metadata system
 - <https://intermagnet.github.io/metadata/>
 - Data plotting
 - Proof-of-concept by CB (but not done and not sure if will complete)
 - <https://intermagnet.github.io/plots/>
 - Activity map

- It's been broken for a bit and CB still hasn't had the time to look into it.
- Github
 - Review GitHub environment
- Future of GINS and data distribution
- CDF, where do we go from here?
- Data sent to the FTP data should not be (IMO)
- Data formats with license

13.2 Review of actions items from Vienna, 2018

Number	Responsible	Description	Status Green completed, Orange ongoing; Red not started
Vienna GWD.A1	CB	Convert the FAQ to GitHub and create a link from the website	FAQ completed. https://intermagnet.github.io/faq/ Waiting for committee contribution before linking
Vienna GWD.A2	SB, all	Contribute corrections/issues to FAQ	Ongoing
Vienna GWD.A3	CB	Advertise the FTP on the website and relevant documentation like FAQ on GitHub	Many static pages converted to GitHub and example website created. https://intermagnet.github.io/ Waiting for committees to contribute comments.
Vienna GWD.A4	SF, CB	Write a text to advertise licensing on the web and FTP	Completed but not advertised on website. https://intermagnet.github.io/data_conditions.html . Waiting for community feedback.
Vienna GWD.A5	SF	Take feedback from the members and follow up with Potsdam	
Vienna GWD.A6	All	Create GitHub accounts and are encouraged to start using it	Ongoing
Vienna GWD.A7	CB	Add links to GitHub on web when relevant documentation need to be linked	Community has not contributed any feedback yet.
Vienna GWD.A8	CB	Mid-year meeting on GitHub	Not done
Vienna GWD.A9	CB	Pursue internal test of an FDSNWS using current INTERMAGNET data flow and add report on data latency	Will be further discussed during the "Future of the web"

Vienna GWD.A10	SF	Clean up versions of the Imagcdview and move it to GitHub	Done
Hermanus GWD.A5	CB	Convert historical data to CDF format on the FTP and keep all original formats	SF has recently transferred CDF data to the INTERMAGNET web and submitted an updated Java utility to convert IAGA2002 to CDF for the archive. Will be further discussed during the “Future of the web”
Hermanus GWD.A7	RL, BH	Provide discussion document on disturbance flagging in CDF format.	Done. A discussion document has been written and published. Vienna Update: RL will publish the document on GitHub
Hermanus GWD.A10	JR, RL	Provide MagPy tool once feedback has been implemented to data checkers and implement additional feedback	Done. There will always be feedback and evolution of the software.
Hermanus GWD.A11	CB	Investigate options for automated data checking through the Web site	Evaluated options using python Flask API for submitting files (without writing to disk) but there is no quick solution. This requires significant development, which I can’t allocate. This does not have to be done by hosting institute. Vienna Update: CB will write a technical requirement document by consulting with others and SF will send the document to the community Ottawa Update: Won’t do
Dourbes GWD.1	SF	Find Discussion Documents that could be converted to technical or policy notes and ask authors to make the conversion.	Vienna Update: SF will follow up with authors to determine if discussion documents can be transformed to technical notes
Dourbes GWD.2	CB	Put these new technical or policy notes (Dourbes action GWD.1) on the web site.	Ongoing with Dourbes GWD.1
Dourbes GWD.9	RL, SF, J. Fee, SB, CB	Create a Discussion Document on using message brokers, JF to lead the document.	JF and SB will continue work on the discussion document on message brokers. Discussion document will address more on message format rather than method (ex: AMQP vs MQTT). There will be different constraints between data acquisition and data dissemination. Discussions will continue at the next GWD meeting.

Dourbes GWD.19	JM	Look into the proposed additions to the IYF documentation and recommend which method of calculating annual means should be used.	Not started
Dourbes GWD.23	SF	Complete testing on software that converts data in ASCII formats (IMF, WDC, IAGA-2002) to binary formats (IAF and ImagCDF). This software is called gm_convert. Release this software to users.	Done

13.3 GINS sending former IMO data

During the presentation of the agendas, CT indicated that some former-IMOs and non-IMOs are available on the INTERMAGNET FTP. These include:

IMO	GIN
ALE	Canada
DMC	Paris
EUA	Canada
LIV	
KLI	
MZL	
QZH	
SNK	Canada
TEO	Edinburgh
TST	Canada

Action item CB + GINS: We will be looking off-line each IMOs provided by CT independently and analyze the source of the problem. Some from Paris, some are Canada and some are others. Canada’s are old files that were not sanitized correctly during a directory structure transition. Optionally, but not mandatory, CB can look into ways of preventing adding them to FTP but still accept them in the archive but the problem should be tackled at the GIN level.

13.4 Licensing

Following previous meetings, INTERMAGNET implemented a licensing schema of CC-BY-NC but how do we identify this in our data files? The other question that arose during the meeting is how do we preserve this information. For example, BGS alters data on reception therefore the license information will be lost.

Action item J.Fee: Investigate the identifiers on spdx.org/licenses and how to add it to the comment of IAGA2002

Action item SF: Look into how to add it to CDF. Possibly added as a metadata with License and string field.

An observatory could request their license to be added but INTERMAGNET could recommend a default. Once this licensing identification is determined, GINS will have to make sure this information is preserved.

Action item J. Fee: Create a repository on GitHub for the sub-committee and start a ticket regarding licensing

13.5 CDF format

SB identified a problem with leap second in the format. The problem is with the leap second table text file and requires an update to the NASA CDF by recompiling the library.

Rather than continue the technical conversation amongst the committee, it will continue as an Issue Ticket on GitHub.

Action item SB + RL: Contribute to an Issue on GitHub regarding CDF format leap second
How should we move forward with CDF? Conversation to continue but the Ottawa GIN is capable of receiving CDF data and making it available on the FTP only.

13.6 Future of the web

13.6.1 Web service

Parts of this section have been removed from this public version of the minutes as it discussed individuals and institutes.

About 2 years ago, Carol Finn, GH, and CB offered Hyderabad to look into hosting a web service following the discussion document collaborated in INTERMAGNET. Before Vienna 2018 meeting, Kusumita Arora provided an example of an FTP-like HTTP page. At IUGG 2019, Kusumita informed SF that they have an evaluation version ready.

SF informed that BGS has developed an internal version web service running on a web cluster that will not influence their mission-critical operations. BGS geomagnetism group has good relations with their security group and will follow up on how to enable the evaluation mode.

They will investigate the option of completing their Core Trusted Seal (WDS certification)

Where does the archive go?

As pointed earlier, BGS alters the metadata so they do not preserve the information provided by the contributing institute. Canada's future should be at no risk until 2021 so should be ok for now. The archive can stay in Canada.

It has been decided to offer a fair competition amongst both institutes and have INTERMAGNET evaluate the performance of both solutions.

Action item CB: Follow up with Hyderabad and BGS for transferring data and respect embargo requirements. Offer a deadline of implementation of 2 months before the next meeting.

Embargo requirement is that data is available for plotting (image) but not available in readable format (eg. JSON, IAGA2002) before embargo time.

The candidate institutes will send their IPs to allow RSYNC from Canada's combined INTERMAGNET directory.

Action item CB: After deadline, we will ask for an evaluation version of the web service and ask OPSCOM members to evaluate the service.

To summarize, the future of the web site is to have:

- Web site = hosted on GitHub
- Web service = tested amongst Hyderabad and BGS
- Archive (FTP) = remain in Canada

13.6.2 Plotting application

BGS has already built-in and demonstrated by SF. Plotting should respect the embargo requirement explained earlier.

Interactive web presentation (eg. <https://intermagnet.github.io/plots>) should not be able to plot the embargo data since it requires readable format data.

This should be a requirement with the web service but should not be mandatory for the initial phase. Since the archive is still available in Canada, Canada can still offer the plotting for the mean time.

13.6.3 Data download application

BGS already developed a tool for downloading data part of their web service. The FTP will still be hosted in Canada for the mean time.

Web statistics show that there are more users going to the FTP rather than the web application.

Should the web download application be preserved or made available in a different format?

Ellen Clarke would like to know the individuals who are downloading. This was taken out of Canada due to privacy security requirements. How will it be done with a web service and how would you present the statistics? There are ongoing discussions amongst other groups.

Should we limit the web service with user credentials? These will be addressed later after the evaluation of the web service solutions.

13.6.4 GitHub

GitHub Account: <https://www.github.com/intermagnet/>

First, should we proceed using GitHub? The quick answer is yes. GitHub will allow the sub-committee members to contribute by adding, modifying, and removing information with controlled peer review without having a single individual responsible (CB).

How do we instruct people to start using this environment?

Action item J. Fee + AM + RL: Modify the contribute.md document on the intermagnet.github.io project. The document will provide brief instructions and links to resources on how to use GitHub.

Action item all: Create a GitHub account

13.6.5 Web site

GitHub web site: <https://intermagnet.github.io>

CB presented to quick mock-up of the potential new intermagnet.github.io web page. In plenary, we will ask everyone if the current look is adequate. The committee will take all the feedback and implement the changes. **This may result in additional actions items.**

Once accepted, we will start linking some components on the current <http://www.intermagnet.org> website to the new site.

Action item CB: Add an information box on the main web page indicating that content has moved to the new website and change links accordingly.

13.6.6 Issue tracking and discussions

We briefly talked about the advantage of doing issue tracking in GitHub.

Action item CB: Add action items (non-sensitive) to GitHub repository for the sub-committee

Action item WWW/GINS/Data Formats: Start discussions as issue (eg: flagging) to GitHub repository

13.6.7 Metadata system

SF provided a brief update on the metadata system in BGS. This metadata system will be a centralized environment where all observatories, institutes, and contacts information will be stored and made available through a web service.

An example tool using the web service was completed by CB at

<https://intermagnet.github.io/metadata>

The current web service was designed to support the current web site and its structure but that is no longer a requirement. BGS will continue the development of the metadata system by using more modern standards. For example, returning observatory responses in GeoJSON.

13.6.8 Future of RSYNC

Parts of this section have been removed from this public copy of the minutes.

RSYNC is the data transfer protocol between GINS and Canada. Is using message protocol an option?

Possible options are:

- Kafka
- MQTT
- SEEDlink

SEEDlink is used in Canada, USGS, and GFZ Potsdam and is standard in the seismic community with commercial tools supporting it. MQTT is used in Belgium and Vienna and requires customization. It is not certain if MQTT will be allowed in Canada. In all cases, metadata is not preserved.

Should we use a scenario for real-time and another for archive method that has no real-time requirement?

Action item CB: Start an exchange on the future of data exchange via GitHub

13.7 Decisions and action items following the Ottawa meeting

13.7.1 Action items

Number	Responsible	Description
Ottawa GWD.A1	CB, GINS	Clean up the FTP and make sure that non-IMO observatories are no longer contributing data to INTERMAGNET
Ottawa GWD.A2	J. Fee	Investigate identifiers on spdx.org and how to add it to the comments of IAGA2002 files
Ottawa GWD.A3	SF	Look into how to add the license identifier to CDF format
Ottawa GWD.A4	SB, RL	Contribute to Issue on GitHub regarding CDF format leap second error
Ottawa GWD.A5	CB	Follow up with Hyderabad and BGS for transferring data for evaluating potential web services
Ottawa GWD.A6	CB	2 months before next meeting, send an email to INTERMAGNET OpsCom to evaluate candidate web services
Ottawa GWD.A7	J. Fee, AM, RL	Modify “contribute.md” on GitHub to instruct people on how to start using the environment
Ottawa GWD.A8	CB	Start moving pages from intermagnet.org to GitHub by informing user through information boxes on current website
Ottawa GWD.A9	CB	Add non-sensitive action items to GitHub
Ottawa GWD.A10	CB	Start a discussion on GitHub on the future of data exchange in INTERMAGNET

13.7.2 Actions items still open from previous meetings

Number	Responsible	Description	Status
Vienna GWD.A2	SB, all	Contribute corrections/issues to FAQ	ongoing
Vienna GWD.A6	All	Create GitHub accounts and are encouraged to start using it	Ongoing
Vienna GWD.A7	CB	Add links to GitHub on web when relevant documentation needs to be linked	Community has not contributed any feedback yet.
Hermanus GWD.A5	CB	Convert historical data to CDF format on the FTP and keep all original formats	SF has recently transferred CDF data to the INTERMAGNET web. SF also gave an updated Java utility to convert IAGA2002 to CDF for the archive. Will be further discussed during the "Future of the web"
Dourbes GWD.9	RL, SF, <u>J.Fee</u> , SB, CB	Create a Discussion Document on using message brokers, JF to lead the document.	J. Fee and SB will continue work on the discussion document on message brokers. Discussion document will address more on message format rather than method (ex: AMQP vs MQTT). There will be different constraints between data acquisition and data dissemination. Discussions will continue at the next GWD meeting.

14 INTERMAGNET Observatories & Standards Subcommittee

Participants

Subcommittee Members: Chris Turbitt (chair), Benoît Heumez, Sergey Khomutov, Andrew Lewis, Jürgen Matzka, & Tero Raita

Not present: Virginie Maury, Benoît St-Louis

Guests: Seiki Asari, Abe Claycomb, David Calp

14.1 Agenda

- IMO action Items from the 2018 meeting
- IMO Applications
 - IMOs closed or withdrawn since the Vienna meeting
 - Update on applications from 2018:
 - New applications:
 - Prospective IMOs:
 - Non-IMO data available on the IM FTP server:
 - ALE (>1998), AMS (>2019), DMC (>2016), EUA, LIV, KLI, MZL, QZH, SNK, TEO (>2013), TST
- IMOs of concern
 - Data checker discussion
 1. Is there a requirement for an independent arbiter on data quality checks?
 2. Should we request reports from data checkers prior to INTERMAGNET meetings?
 - Non-compliant IMOs new policy, web site requirements
 - Resolved IMO issues since last meeting
 - Lists of IMOs of concern and IMOs awaiting checking:
 - *Report from BH on the IGP network
 - Report at the 2018 meeting on the performance of IMOs meeting QD specification in 2015 – how to present results and how to feedback to IMOs
- IMO Subcommittee contributions to the Technical Manual
 - Daily and annual mean calculations – is description in TM v5 d1.0 Sec.6.6 sufficient?
 - Further definition of the “I – incomplete” flag in the IYFV1.01 data format required
 - Calculation of the F-component in the annual mean files –mathematically consistent with the annual mean of XYZ, or calculated as the mean of the base (one-minute or one-second) F data?
 - “Dual use” customs regulations for high specification magnetometers
 - Any outstanding items?
- Standards
 - Handling leap-seconds in one-second data
 - GPS week number roll-over (6 April 2019)
 - Current status of instrumentation meeting the one-second standard
- IMO Subcommittee Action Items following the Ottawa Meeting

14.2 Review of action items from Vienna, 2018

14.2.1 Action items

Parts of this section has been removed from this public copy of the minutes as it contained discussions about individuals, observatories and institutes.

Number	Responsible	Description	Status
			Green completed Orange ongoing Red not started
IMO.4	CT	Instigate monitoring of real-time & preliminary data delivery by IMOs in co-ordination with CB	CT has code to generate this information from the INTERMAGNET FTP server, so no longer required. Deleted
IMO.5	CT	Draft an internal policy for non-compliant IMOs for review by EXCON & the IMO Subcommittee	Prepared for this meeting for discussion. Completed
IMO.11	CT	Update the IMO application form to reflect the two delays available on the web site (plotting and data download)	New version (v3.2) needs to be copied to INTERMAGNET web site Completed
IMO.12	JM, CT, AL	Provide an e-mail address for the INTERMAGNET secretary from GFZ and ensure this is accurate on the INTERMAGNET web site	Completed
IMO.13	BSL	Consider the calculation of the F-component in the annual mean files – should this be mathematically consistent with the annual mean of XYZ, or should it be calculated as the mean of the base F data (one-minute or one-second)? (Carried forward from Dinant meeting).	Added to the IMO Subcommittee agenda for this meeting Covered by the Definitive Data Subcommittee during the meeting Deleted
IMO.14	BSL	BSL is to add a comment in the manual to the effect that, “INTERMAGNET recommends that the scalar magnetometer is sampled at the highest possible rate and that the data are	Completed

		filtered to one-minute values using the filter specified in Section 2.4”.	
IMO.20	JM	Conduct a survey of the metadata in the IMO readme files for the last published INTERMAGNET CD to see which IMOs state that the filter is non-compliant.	This was superseded during the meeting with a DD action item to instruct all IMOs to centre on-minute data on MM:00 and also to request that data checkers inspect readme files to check for compliance. Deleted
IMO.22	CT	Set a date for an interim online IMO Subcommittee meeting	Outstanding

14.3 IMO Applications

14.3.1 IMOs closed or withdrawn since the Vienna meeting

This section has been removed from this public copy of the minutes as it contained discussions about observatories and institutes.

14.3.2 Update on applications from 2018

This section has been removed from this public copy of the minutes as it contained discussions about observatories and institutes.

14.3.3 New applications:

This section has been removed from this public copy of the minutes as it contained discussions about observatories and institutes.

14.3.4 Prospective IMOs

This section has been removed from this public copy of the minutes as it contained discussions about observatories and institutes.

14.3.5 Non-IMO data available on the IM FTP server

The following observatory codes have data listed on the INTERMAGNET FTP server. As these observatories are not currently, or have never been, IMOs there is an action on the GWD Subcommittee to remove the following data:

- ALE (from 1998), AMS (from 2019), DMC (from 2016), EUA, LIV, KLI, MZL, QZH, SNK, TEO (from 2013), TST

14.4 IMOs of concern

14.4.1 Data checker discussion

Subcommittee discussed whether any new methods of working could be adopted to improve the role of data checkers, who often have difficulties with problematic observatories. Such difficulties can lead to long-term dialog with IMOs without reaching a resolution. Two questions were put to Subcommittee:

14.4.1.1 Is there a requirement for an independent arbiter on data quality checks?

The Subcommittee discussion included three data checkers - AL, TR & Dave Calp - all of whom asked what official policy was for IMOs that failed to remedy issues of quality and where communication was difficult. Subcommittee also asked whether better communication between data checkers could help with homogeneity of the checking procedure.

Subcommittee needed clarification that JRD would make the ultimate assessment on problematic IMOs. CT stated that grey areas in the standards should be brought to the attention of the IMO & Standards Subcommittee.

TR & BH are to begin a discussion document on the data checking procedure, listing acceptable quality thresholds, what to do when thresholds are not met and highlighting grey areas in the standards. **(AI IMO.10 TR & BH)**

14.4.1.2 Should we request reports from data checkers prior to INTERMAGNET meetings?

Subcommittee agreed that it would help data checkers to highlight problematic IMOs if the DD Subcommittee requested a short report from data checkers before each INTERMAGNET meeting describing the status of IMOs definitive data submission and acceptance, including recent communications between the data checker and the IMO. **(AI IM.11 JRD)**

14.4.2 Non-compliant IMOs new policy, web site requirements

Subcommittee reviewed a draft of Policy Note PN1 (INTERMAGNET Participation Policy) which proposes to introduce non-compliant status for IMOs – ref. requirements on web site stated in Vienna meeting action item EXC.A6.

This proposal would designate IMOs as non-compliant where they failed to meet data delivery requirements for a period of two years. Once designated as non-compliant, IMOs would be given a deadline (definitive data delivery date in the following calendar year) to meet INTERMAGNET specifications before a request is sent to EXCON to remove the IMO from INTERMAGNET.

Non-compliant IMOs would be contacted directly, with the relevant data checker and the DD Subcommittee chair cc'd. Non-compliant IMOs will not be listed as such on the INTERMAGNET web site. This removes the need for substantial rework of the INTERMAGNET web site and ongoing maintenance to keep multiple lists updated.

The proposed policy (draft 1) was accepted by Subcommittee with minor wording changes. The policy is to be sent to EXCON for approval **(AI IMO.5 CT)**

14.4.3 Resolved IMO issues since last meeting

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

Status	IMO	Issue

14.4.4 Lists of IMOs of concern and IMOs awaiting checking:

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

Status	IMO	Issues

14.5.2 Further definition of the “I – incomplete” flag in the IYFV1.01 data format required

This topic has been discussed in Definitive Data Subcommittee so was not discussed here.

14.5.3 Calculation of the F-component in the annual mean files

The topic of whether the F-component in the annual means files should be mathematically consistent with the annual mean of XYZ, or calculated as the mean of the base (one-minute or one-second) F data was discussed in Definitive Data Subcommittee so was not discussed here.

14.5.4 “Dual use” customs regulations for high specification magnetometers

JM reported that exporting fluxgate magnetometers with a noise level of 10pT @ 1Hz or less is restricted to some countries by international dual use regulations. Scalar magnetometers are understood to have a limit of 20pT @ 1Hz, which is maybe why GEM Systems specify a noise level of 22pT @1Hz.

JM suggest that, through lobbying, regulations could be changed to exempt magnetometers for magnetic observatories as exemptions are in place for medical research.

JM & CT are to look at existing regulations, contact government and EU agencies for clarification and report on whether there is an issue. Ultimately, any action could be delegated to instrument manufacturers. **(AI IMO.15 JM & CT)**

14.5.5 Any outstanding items?

Calculation of one-minute means centred on second mm:30 rather than mm:00 was discussed in plenary session.

2019 action item TM.11 was created by the TM Subcommittee to clarify wording on the calculation of minute means. CT is to contact IMOs currently known to centre data on 00:30 to state that past data will be accepted up to 2021. IMOs centring minute means on 00:30 should make this clear in the metadata (README files). **(AI IMO.16 CT)**

JM has a list of ~10 observatories that are thought not to comply.

SF accepted an AI in plenary session to investigate whether there is an ability to add metadata to the definitive data DOI that describes known issues with past data.

14.6 Standards

14.6.1 Handling leap-seconds in one-second data

Not discussed. To be carried over to next meeting.

14.6.2 GPS week number roll-over (6 April 2019)

Not discussed. To be carried over to next meeting.

14.6.3 Current status of instrumentation meeting the one-second standard

Not discussed. To be carried over to next meeting.

14.7 Decisions and action items following the Ottawa meeting

14.7.1 Decisions

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

#	Description
IMO.D19.4	The IMO Subcommittee accepted a change to policy document PN1 that defined IMO non-compliant status and procedure for notification and withdrawal of IMOs

14.7.2 Action Items

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

Number	Responsible	Description
IMO.A5	CT	Submit internal policy for non-compliant IMOs to EXCON for review
IMO.A8	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)
IMO.A10	TR, BH	Produce a Discussion Document for data checkers on the data checking procedure, acceptable quality thresholds and what to do when these thresholds have not been met. Also start a list of “grey area” issues that need clarification from OpsCom
IMO.A11	JRD	Request a brief IMO status report from data checkers prior to the next INTERMAGNET meeting, highlighting issues with data acceptance and ‘grey areas’ in the standards, and distribute to Ops Com for consideration at the meeting
IMO.A12	CT	Ask Sue Macmillan why the QD delivery reports from BGS to IMOs have stopped and how best to contact the QD user community to feedback results of any QD quality study.
IMO.A13	AL	Contact individual IMOs that didn’t meet QD standard in 2015, as highlighted in the report to the Vienna meeting, to notify of issues
IMO.A14	AL	Re-run the QD study for 2017 data and consider presenting at the IAGA Observatory Workshop in 2020
IMO.A15	JM, CT	Contact government and EU agencies for clarification on whether one-second magnetometers fall foul of dual use customs regulations
IMO.A16	CT	Contact IMOs that are not currently centering data on the minute (MM:00) and notify that data with this issue will continue to be accepted for two years, after which data will no longer be accepted. Notify SK also

IMO.A20	CT	Set a date for an interim online IMO Subcommittee meeting
---------	----	---

15 Technical Manual Subcommittee

Participants

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

Absent: Benoit St-Louis

Guests: David Calp, Abe Claycomb, Benoit Heumez, Sergey Khomutov

15.1 Agenda

- Committee membership (missing expertise?)
- Review of Vienna actions items
- Technical Manual
 - Review status of draft Version 5.0.0 draft 1.0
 - Publication of version 5.0.0
 - Proof read (offer from AL or possible task for last day working group)
 - Set publication date (September?)
 - Create a list of new items for version 5.0.1 (draft document provided)
 - DOI for Technical Manual
- Web (postponed from last meeting)
 - Synchronization of data format with Technical Manual (one source only with active links or references)
 - Other links to/from the web site
 - Policy and Technical notes to be published
 - FAQ maintenance
 - Web site review
- Future of web site
 - Impact on Technical Manual distribution
 - Pros and cons of various formats (HTML, Markdown, Words etc.)
- INTERMAGNET on Wikipedia
 - Check contents
 - Update as needed
- Other topics
 - 90% rule
 - Centring one-minute means on mm:00
 - Flagging data
 - Web services
- Round table
- Distribution of actions items
- Schedule video conference in September
 - Set date and time (availability of subcommittee members?)

15.2 Committee membership

The TM Subcommittee membership was discussed at the beginning of the meeting. The subcommittee agree that there were good links to other subcommittees and that there were no immediate needs for further membership. This may change with future requirements (such as porting the manual to different

platforms), so the membership will be reviewed on a regular basis and will be adjusted to reflect the workload. Many thanks to CT, acting chair, during the Ottawa meeting in the absence of the chair.

15.3 Review of actions items from Vienna, 2018

AL requested that action items TM.01 through to TM.12, which deal with plenary actions related to the OPSCOM Secretary are moved from the Technical Manual Subcommittee minutes to plenary minutes for future meetings.

Number	Responsible	Description	Status Green completed, Orange ongoing; Red not started
TM.01	Subcommittee Chairs	Provide list of action items and decision logs to secretary within 6 weeks.	Completed
TM.02	Secretary	Distribute list of action items to INTERMAGNET members within 8 weeks.	Completed
TM.03	Subcommittee Chairs	Provide subcommittee reports to secretary for inclusion in the minutes within 6 weeks.	Completed
TM.04	Subcommittee Chairs	Provide report to IMOs for your subcommittee to OpsCom chair within 6 weeks.	Completed
TM.05	Secretary	Provide draft of minutes within 12 weeks. Note that a decision was made that secretary will only compile plenary minutes and subcommittee minutes will be compiled by subcommittee chairs.	Completed
TM.06	OpsCom chair	Produce report to IMOs and send to IMO contacts, Worldobs and post on INTERMAGNET WEB site within 12 weeks.	Completed
TM.07	INTERMAGNET officers	Review draft minutes within 14 weeks.	Completed
TM.08	Secretary	Put the final INTERMAGNET minutes on the document archive and distribute to INTERMAGNET officers within 16 weeks.	Completed
TM.09	OpsCom chair and Secretary	Prepare version of the minutes for general distribution within 20 weeks.	Completed
TM.10	INTERMAGNET officers	Review “public minutes” within 22 weeks.	Completed
TM.11	Secretary	Put “public minutes” on INTERMAGNET web site and send to IMO contacts within 24 weeks.	Completed
TM.12	CT	Add meeting decisions to decision logs.	Completed
TM.13	BSL	Organize a video conference with the Technical Subcommittee members in early fall to review progress.	Outstanding (most of the work was completed during the last day working group)
TM.14	BSL	Update Section 1.8 (membership and OPSCOM structure).	Completed
TM.15	JM	Contribution to Section 6.4 “Definitive Data Calculation based on HDZ Oriented Variometer”.	Completed

TM.16	JM	Definitive data calculation based on most common orientations and types of instruments (section 6.4 long term).	JM reported, “done, includes HDZ and XYZ, if INTERMAGNET wants more, I suggest that this should be done by people who actually use the other orientations” Completed
TM.17	JM, CT	Production of QD data. Might be desirable as a follow-up from Hermanus action TM.12 which was converted to submission. Could also be link with FAQs. (long term)	JM reported, “to be done soon” Outstanding
TM.18	SF	Once TM5 has been completed, verify that Real-time definition is consistent throughout the manual and defined along with target transmission delays.	Completed by SF during the meeting working session
TM.19	GWD Subcommittee	Once TM5 has been completed, perform final review of data formats in the Technical Manual.	Completed
TM.20	AL	Once TM5 has been completed, perform final review of Technical Manual V-5.	Completed during the meeting working session
TM.21	BSL	Once completed, publish the Technical Manual V-5.0.0 on the INTERMAGNET web site.	Outstanding
TM.22	JM	Provide reference for Absolute quality control and curve-fitting algorithms.	JM reported, “done” Completed
TM.23	JM	Create a Discussion Document on the estimation of errors in the production of Definitive Data.	JM suggested that this is a long-term project and requested it be reassigned Outstanding
TM.24	TM Subcommittee	Review and implement recommendations for the FAQs on the IM web site.	Completed
TM.23	SF	Review all existing discussion documents to see whether any of these can be converted to technical notes.	Completed
WG.01	CT	Production of Quasi-Definitive data section 6.3.5	Completed
WG.02	JM	Review section 4.7	Completed
WG.03	AT, BSL	Add Vision and Mission statements to Chapter 1	Completed
WG.04	SF	Update components table in section 6.1.2	Completed
WG.05	JM	Update Computation of Baseline values section 5.3 with reference to section 6.5	Completed

WG.06	JM	Update Baseline Adoption section 5.4 with curve-fitting algorithms	Completed
WG.07	CT	Create section 5.2 on Data Quality Control	Completed
WG.08	CB	Re-write FTP Server section 7.2 for the new FTP server without credentials	Completed
WG.09	Anne Neska	Review Using INTERMAGNET Data Chapter 7	Completed
WG.10	JM	Create a section on de-spiking in Chapter 5 section 5.2.2	Completed
WG.11	JM	Create a section on Absolute Quality Control in Chapter 5 section 5.2.3	Completed
WG.12	BSL	Incorporate latest description of Quasi-Definitive data	Completed
WG.13	BSL	Update INTERMAGNET structure in section 1.8, GINs and Members contacts	Completed
WG.14	BSL	Update NOAA URL	Completed
WG.15	CB	Section 1.1 Numbers too small 2018, provide new numbers with date	Completed
WG.16	CB	Provide information on statistics for Section 1.4 (10) Monthly?	Completed
WG.17	BSL	Replace Map and table B-1 with link	Completed (Appendix B-1 was replaced with a link to the web site, link will be moved to the document and appendix B-1 will be removed when the future of the web site will be known)
WG.18	BSL	Remove Section 1.5 2 nd paragraph	Completed
WG.19	BSL	Update index	Completed
WG.20	BSL	Update active links	Completed
WG.21	SF	Find location and provide text to describe that Lat, long and altitude should be given in the WGS84 system	Completed
WG.22	AL	Update section 5.2.1 Checking Procedure with reference to section 6.1.2 for the components, create a new component image to be moved to section 6.1.2	Completed
WG.23	AL	Simplify section 5.5 The Computation of Total Field Differences with reference to section 6.5	Completed
WG.24	BH, JRD	Check DVD/CD-ROM directory structure Appendix C-2	Completed

WG.25	Tero Raita, Achim Morschhauser	Check INTERMAGNET Archive data format IAFV2.11 section 6.4.3 and Appendix C-1 for text description	Completed
WG.26	Tero Raita, Achim Morschhauser	Check INTERMAGNET Archive data format IAFV2.11 section 6.4.3 and Appendix C-1 section 6.4.3 for accuracy of info (difference between various sources)	Completed
WG.27	Tero Raita, Achim Morschhauser	Check INTERMAGNET Archive data format IAFV2.10 Appendix C-1 for text description	Completed
WG.28	Tero Raita, Achim Morschhauser	Check INTERMAGNET Archive data format IAFV2.10 Appendix C-1 for accuracy of info (difference between various sources)	Completed
WG.29	Tero Raita, Achim Morschhauser	Check INTERMAGNET Archive data format IAFV2.00 Appendix C-1 for text description	Completed
WG.30	Tero Raita, Achim Morschhauser	Check INTERMAGNET Archive data format IAFV2.00 Appendix C-1 for accuracy of info (difference between various sources)	Completed
WG.31	Tero Raita, Achim Morschhauser	Check INTERMAGNET Archive data format IAFV1.10 Appendix C-1 for text description	Completed
WG.32	Tero Raita, Achim Morschhauser	Check INTERMAGNET Archive data format IAFV1.10 Appendix C-1 for accuracy of info (difference between various sources)	Completed
WG.33	Tero Raita, Achim Morschhauser	Check INTERMAGNET Archive data format IAFV1.00 Appendix C-1 for text description	Completed
WG.34	Tero Raita, Achim Morschhauser	Check INTERMAGNET Archive data format IAFV1.00 Appendix C-1 for accuracy of info (difference between various sources)	Completed
WG.35	SB, VM	Check INTERMAGNET Archive data format IYFV1.02 Appendix C-3 for text description	In progress (ready for publication but a few questions need answers)
WG.36	SB, VM	Check INTERMAGNET Archive data format IYFV1.02 Appendix C-3 for accuracy of info (difference between various sources)	Completed
WG.37	SF, CB	Check INTERMAGNET Archive data format IMFV2.83 Appendix E-1-3 for text description	Completed
WG.38	SF, CB	Check INTERMAGNET Archive data format IMFV2.83 Appendix E-1-3 for accuracy of info (difference between various sources)	Completed
WG.39	SB, VM	Check INTERMAGNET Archive data format IBFV2.00 Appendix E-4 for text description	In progress (ready for

			publication but a few questions need answers)
WG.40	SB, VM	Check INTERMAGNET Archive data format IYFV2.00 Appendix E-4 for accuracy of info (difference between various sources)	Completed
WG.41	SB, VM	Check INTERMAGNET Archive data format IBFV1.20 Appendix E-4 for text description	Completed
WG.42	SB, VM	Check INTERMAGNET Archive data format IYFV1.20 Appendix E-4 for accuracy of info (difference between various sources)	Completed
WG.43	Jeremy Fee, HT	Check INTERMAGNET Archive data format IAGA2002 Appendix E-5 for text description	In progress (ready for publication but good suggestions to improve the description will need discussion with the data format subcommittee)
WG.44	Jeremy Fee, HT	Check INTERMAGNET Archive data format IAGA2002 Appendix E-5 for accuracy of info (difference between various sources)	Completed
WG.45	SB, VM	Check INTERMAGNET Archive data format IBFV2.00 Appendix E-4 for text description	Completed
WG.46	SB, VM	Check INTERMAGNET Archive data format IYFV2.00 Appendix E-4 for accuracy of info (difference between various sources)	Completed
WG.47	RL, Seiki Asari	Check INTERMAGNET Archive data format IMAGCDFV1.20 Appendix E-6 for text description	Completed
WG.48	RL, Seiki Asari	Check INTERMAGNET Archive data format IMAGCDFV1.20 Appendix E-6 for accuracy of info (difference between various sources)	Completed
WG.49		Review WEB site for out of date information (???)	Completed by AM during the meeting working session
WG.50		Review WEB site for out of date information (???)	

15.4 Technical Manual

15.4.1 Review status of draft version 5.0.0 draft 1.0

All actions items required for the publication of the Technical Manual have been completed and incorporated to the draft version of the manual.

The subcommittee discussed the inconsistencies in the definitions of components between Sections 6.1.3 and 6.5 in V5d1.0 of the Technical Manual. Some of the 'components' currently defined in 6.1.3

are not magnetic components but rather instrument sensor orientations. During the meeting, JM redrafted version of Section 6.1.3 for the publication of V5.0.

15.4.2 Publication of version 5.0.0

- A Technical Manual review group was run in plenary session on the final day to check spelling and grammatical correction and for erroneous links. A list of minor edits, plus a list of major edits for future versions, was forwarded to the Technical Manual Subcommittee chair after the meeting. Appendix A includes a list of those in the review group and the tasks assigned.
- A publication date for V5.0 of the Technical Manual 30 September 2019 was agreed.

15.4.3 Create a list of new items for version 5.0.1

The following list of additions for the next version of the Technical Manual was compiled by the Technical Manual Subcommittee chair as well as by collating topics from the manual review session in plenary:

- Inclusion of the clarification on the 90% missing data rule for non box-car filters (see agenda item 15.8.1 below)
- Further definition of the “I – incomplete” flag (in addition to of A, Q, D) in the IYFV1.01 data format required (Vienna minutes 11.10). This is a Definitive Data Subcommittee action item from the Ottawa 2019 meeting
- Step by step guide for INTERMAGNET specific work necessary for an observatory to comply with INTERMAGNET formalities
- Guidance on how to prepare 1-min and 1-sec definitive data (Vienna minutes 11.6.2) and Definitive Data Action Item DD.A1 from Vienna meeting
- Description of the future of the INTERMAGNET WEB site once this has been decided by the GWD Subcommittee
- Updating obsolete information on WEB site (in the meantime)
- FAQ Addition/revision
- Description on the use of DOIs for data/metadata publication in INTERMAGNET
- Description of the methods of data distribution employed by INTERMAGNET, both internally and externally: web services, SEEDLink, etc.
- Data quality: guide to the process of despiking data
- Flagging of data – how to preserve data rather than deleting it using a separate flag data field
- Reference to the INTERMAGNET Wikipedia page
- Check INTERMAGNET Archive data format IBFV2.00 Appendix E-4 for text description (see WG.35 from the 2018 Vienna minutes)
- Check INTERMAGNET Archive data format IAGA2002 Appendix E-5 for text description (see WG.39 from the 2018 Vienna minutes)

15.4.4 Digital Object Identifier (DOI) for the Technical Manual

It was decided that a Digital Object Identifier (DOI) would be minted for the publication of V5.0 of the Technical Manual and this would be maintained to reference future publications. JM & SF offered to assist.

TM.5 BSL Consult JM & SF on minting a DOI for the publication of V5 of the Technical Manual

15.5 Web

15.5.1 Synchronization of data format with Technical Manual (one source only with links)

The subcommittee agreed that the Technical Manual should be maintained as the primary source of information (e.g. data format definitions) and that the web site should reference the manual through links.

15.5.2 Other links to/from the web site

The subcommittee agreed with BSL's decision to maintain references to Appendix B-1 in the text. B-1 refers to an IMO list on the web. Links have been left in (rather than referencing directly) to reinstate the IMO list in the manual should the web site disappear. It also saves removing the appendix and updating all other references in the text.

15.5.3 Policy and technical notes to be published

This has been completed by SF – reference plenary session action items.

15.5.4 FAQ maintenance

Currently, FAQ pages on the web site are not being maintained whilst there is a hiatus in web site development prior to the development of an equivalent application in GitHub. SB provided comments last year but these have yet to be implemented.

15.5.5 Web site review

A review was completed by Achim Morschhauser during the review session in plenary. A list of missing or outdated information, plus broken links, was forwarded to the Technical Subcommittee chair after the meeting.

In addition to Achim's review, the subcommittee identified the two issues with the current web site:

- INTERMAGNET policies are not accessible from the Principles, Conditions and Policies menu
- Multiple versions of data formats are confusing. Legacy formats should be maintained in the manual and only current versions listed on the web site.

The subcommittee raised concerns over users' ability to edit content once the web site moves to GitHub and also the approvals process for content e.g. changes to the Technical Manual should be approved by the Technical Manual Subcommittee chair.

The first of these points was addressed by a training session provided by CB & Jeremy Fee during plenary session. Also, in plenary, CB assured that more than one person can be assigned approval authorisation in GitHub.

15.6 Future of web site

15.6.1 Impact on Technical Manual distribution

The subcommittee agreed that there was a need to provide periodic, downloadable versions of the Technical Manual with clear version numbering that can be released as (e.g.) PDF and assigned a DOI. Jeremy Fee had advised that version releases can be managed within GitHub – this needs to be investigated.

JM & HT queried security under GitHub and the facility to maintain private areas for development. Abe Claycomb advised that workflow forks can be assigned as private with several layers of access for contributors.

SK recommended PDF releases such that comments can be easily added. CT stated that Git is designed to allow issues to be submitted. Issues could be used to highlight errors in content or missing information. These issues can then be assigned to developers in the same way as action items are currently used by the subcommittee.

15.6.2 Pros and cons of various formats (HTML, Markdown, Words etc.)

CT passed on BSL's comments on the benefit of HTML over Markdown for formatting content such as tables. The subcommittee agreed that there is not currently sufficient experience within the subcommittee for constructive discussion on the best format for future development of the Technical Manual.

TM.12 BSL Consult with CB & Jeremy Fee to format TM in an HTML form suitable for GitHub that optimises the production of PDF formats of future versions of the manual (beyond the September 2019 release)

15.7 INTERMAGNET on Wikipedia

15.7.1 Check contents

The INTERMAGNET Wikipedia page was updated by AT following the Vienna meeting, however the page was subsequently edited by a Wikipedia moderator to remove 'copyright' content taken from the INTERMAGNET web site. As a result, the page is no longer complete.

15.7.2 Update as needed

AT was assigned the task of review and update of the INTERMAGNET Wikipedia page during the review session in plenary. This was completed, though the Wikipedia page will continue to evolve to reflect INTERMAGNET achievements

15.8 Other topics

15.8.1 90% rule

The subcommittee discussed the IAGA 90% rule for missing data as currently described in Sections 2.5, 3.5 & 6.6.4 of TM5 d1.0 and how this should be applied to non box-car filters i.e. to weighted filters. The subcommittee agreed that the "simple and pragmatic" IAGA approach should be maintained but the question remained on whether the 90% rule should be interpreted as 90% of the values or 90% of the weight of the filter.

The subcommittee decided that, due to the small effect of either interpretation, the 90% can be implemented either way. The 90% rule in the Technical Manual should be updated to state that the 90% rule can be interpreted as 90% of the values or 90% of the weight of the filter. Both are acceptable.

TM.10 BSL Modify Technical Manual references to the 90% rule to state that this can be interpreted either as 90% of the values or 90% of the weight of the filter

15.8.2 Centring one-minute means on mm:00

JM noted that at least two IMOs are supplying one-minute means as flat means of data between mm:00 & mm:59, i.e. centred around second 30 rather than second 00 (mm:00), equivalent to a ~30-second time-shift.

Section 2.3 of TM 5 d1.0 states that IMOs “must try to meet the recommendation” that one-minute filters should be centred on mm:00. The manual needs to be to state that IMOs must centre one-minute filters on the minute.

TM.11 BSL Modify Technical Manual references to one-minute means to state that IMOs must (rather than should try to) centre these values on mm:00

TM.6 JM Investigate whether GFZ supported IMOs can fix the issue concerning centring one-minute values on the minute

15.8.3 Flagging data

The subcommittee recommended that future versions of the Technical Manual will contain a description of the use of flags as a separate data field in CDF format such that data can be flagged as corrupt rather than deleted. RL has completed a discussion document (DD31) that outlines this. This has been added to the draft list of items for future versions of the manual and the GWD Subcommittee is to take this forward.

15.8.4 Web services

The GWD Subcommittee reported that the implementation of web services for data & metadata distribution in INTERMAGNET is not yet finalised, so is not currently ready to be included in the Technical Manual. This has been added to the draft list of items for future versions of the manual.

15.9 Round table discussion

The subcommittee discussed whether the manual clearly stated that the calculation of daily, monthly and annual means should be from the one-minute data as this is the check implemented by check1min. Section 6.6 of TM5 v1.0 does state that means “must be... the arithmetic average of the 1-minute data”. JM is to change GFZ software to implement this.

15.10 Decisions and action items following the Ottawa meeting

15.10.1 Decisions

Number	Description
TM.D19.1	Publications of the Technical Manual will be assigned a Digital Object Identifier (DOI)
TM.D19.2	An IMO can interpret the 90% rule for missing data either as 90% of available input data points or as 90% of the available weight of the applied filter
TM.D19.3	V5.0 of the Technical Manual will be published on the 30 September 2019.

15.10.2 Action Items

Number	Responsible	Description
TM.A1	BSL	Organize a video conference with the Technical Subcommittee members in September to prepare for publication of the Technical Manual.

TM.A2	JM, CT	Production of QD data. Might be desirable as a follow-up from Hermanus action TM.12 which was converted to submission. Could also be link with FAQs. (long term)
TM.A3	BSL	Once completed, publish the Technical Manual V-5.0.0 on the INTERMAGNET web site.
TM.A4	Unassigned	Create a Discussion Document on the estimation of errors in the production of Definitive Data.
TM.A5	BSL	Consult JM & SF on minting a DOI for the publication of V5 of the Technical Manual
TM.A6	JM	Investigate whether GFZ supported IMOs can fix the issue concerning centering one-minute values on the minute
TM.A7	BSL	Incorporate the editorial changes to TM V5 d1.0 in advance of the online TM Subcommittee meeting September
TM.A8	BSL	Publish V5 by 30 September 2019
TM.A9	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	BSL	Modify Technical Manual references to one-minute means to state that IMOs must (rather than should try to) centre these values on mm:00
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 the September 2019 release)
WG.35	SB, VM	Check INTERMAGNET Archive data format IYFV1.02 Appendix C-3 for text description
WG.39	SB, VM	Check INTERMAGNET Archive data format IBFV2.00 Appendix E-4 for text description
WG.43	Jeremy Fee, HT	Check INTERMAGNET Archive data format IAGA2002 Appendix E-5 for text description
WG.49		Review WEB site for out of date information (???)

15.11 Schedule video conference in September

15.11.1 Set a date and time

CT sent a request for 10:00UT (06:00EDT) on 12th September 2019 for an online editorial meeting of the Technical Manual Subcommittee to discuss the proposed release of version 5.0 on 30th September.

15.12 Technical Manual work session

The following is a list of those participating in the Technical Manual Version 5 Draft 1.0 review group on the afternoon of Monday 22 July, along with their assignments:

Officer	Task
Abe Claycomb	Table of Contents
Kristen Lewis	Chapter 1
Ellen Clarke	Chapters 2 & 3
Seiki Asari	Chapter 4

Tsubasa Kotani	Chapter 5
Roman Leonhardt	Chapter 6 up to end of 6.2
Andrew Lewis	Chapter 6 from 6.3 to end
Stephan Bracke	Chapters 7 & 8
Chris Turbitt	Appendices A-D
Jan Reda	Appendices E-F
Simon Flower	Checking the whole manual for consistency on the definition of “real-time”
Jürgen Matzka	Checking changes submitted

In addition, the following review group were tasked with checking/revising online content:

Officer	Task
Alan Thomson	Checking/editing the INTERMAGNET Wikipedia page
Achim Morschhauser	Checking content, links, etc. on the INTERMAGNET web site

16 Work sessions (Monday 22 July)

16.1 Technical Manual updates (CT)

The draft of Technical Manual version 5.0 was distributed to those present at the meeting and sections of the manual allocated for checking and comments. Comments and suggestions were provided to CT via email at the end of the session. A list of the people involved in the checking and their tasks are listed in section 15.12.

16.2 GitHub demonstration (J. Fee, A. Claycomb)

A discussion and live demonstration on workflows and procedures required to contribute content to INTERMAGNET repositories hosted on github.com/intermagnet with emphasis on the new draft INTERMAGNET web site at intermagnet.github.io. Participants in the demonstration had the opportunity to ask questions, make content changes and submit “pull” request to familiarise themselves with the process.

16.3 MagPY demonstration (RL)

A discussion and practical demonstration of features in the MagPy software and how to use the software to check and process geomagnetic data.

17 Appendix

17.1 Meeting agenda

Day 1 : Saturday, 20 July, 2019			
Time	Topic	Duration	Rooms
9:00	Procedures in INTERMAGNET: S Flower	5	Frontenac A
9:05	Any change in the need for an IDA subcommittee: A Thomson	5	Frontenac A
9:10	Do we need new officers? Is subcommittee membership appropriate?	20	Frontenac A
Opening Plenary session			
Guests please do not arrive before this point in the meeting			
9:30	Welcome address by S Flower (local information)	5	Frontenac A
9:35	Welcome by A Thomson	5	Frontenac A
9:40	Approval and changes of/to main agenda	10	Frontenac A
9:50	Presentation of 4 subcommittee meeting agendas + proposals	30	Frontenac A
10:20	Guests present themselves; Guest's posting to subcommittees	10	Frontenac A
10:30	Coffee	30	
Plenary			
11:00	Review of action items in plenary and by subcommittee	45	Frontenac A
Items for subcommittees^[3]			
11:45	Technical manual progress: C Turbitt	5	Frontenac A
11:50	Publication of one second data: J Reda	10	Frontenac A
12:00	Progress on licensing and DOIs: S Flower	10	Frontenac A
12:10	Future of the INTERMAGNET web site and data archive: S Flower, C Blais	10	Frontenac A
12:20	Progress on INTERMAGNET Reference Data Set (See Vienna Excon Action A.4): S Flower	10	Frontenac A
12:30	Lunch^[2]	60	
Plenary Presentations			
13:30	Canada's geomagnetic + space weather + earthquakes operations : C Blais	15	Frontenac A
13:45	USGS Geomagnetism Data Framework and planning: J Fee	15	Frontenac A
14:00	Update on geomagnetic metadata: S Flower	10	Frontenac A
14:10	Geomagnetic metadata and the INTERMAGNET web site: C Blais	10	Frontenac A
14:20	DOIs and INTERMAGNET: K Elger	10	Frontenac A
14:30	INTERMAGNET's relationship with SuperMag: J Matzka	10	Frontenac A
14:40	Comparison between 1-min and 1-sec 2014 definitive data: H Toh	10	Frontenac A
14:50	Kakioka's cooperation in definitive data checking: S Asari	10	Frontenac A
15:00	An update on WMO "OSCAR" and INTERMAGNET observatories, L Trichtchenko	10	Frontenac A
15:10	Update on NanoMagSat cube satellite proposal: G Hulot	10	Frontenac A
15:20	Proposal to promote variometer stations in Canada: G van Beek	10	Frontenac A
15:30	Coffee	30	

Subcommittee & Excon sessions			
16:00	Subcommittee meetings: Tech Manual & WWW/Gins/Formats & Excon	45	Frontenac C/A/B
16:45	Subcommittee meetings: IMO apps & Definitive Data & Excon	45	Frontenac C/A/B
17:30	End of day 1		

Note 1: Frontenac A - (25-30 people); Frontenac B - (15 people); Frontenac C - (15 people)

Note 2: Lunch is available in the hotel, at a cost to participants

Note 3: These are items currently affecting INTERMAGNET that need discussion in both plenary and subcommittees.

Day 2: Sunday, July 21, 2019			
Subcommittee & Excon sessions			
9:00	Subcommittee meetings: IMO Apps & WWW/Gins/Formats & Excon	90	Frontenac C/A/B
10:30	Coffee	30	
11:00	Subcommittee meetings: Tech Man & Definitive Data & Excon	90	Frontenac C/A/B
12:30	Lunch^[2]	60	
13:30	Subcommittee meetings: Tech Man & WWW/Gins/Formats & Excon	60	Frontenac C/A/B
14:30	Subcommittee meetings: IMO Apps & Definitive Data & Excon	60	Frontenac C/A/B
15:30	Coffee	30	
16:00	Subcommittee meetings: IMO Apps & WWW/Gins/Formats & Excon	45	Frontenac C/A/B
16:45	Subcommittee meetings: Tech Man & Definitive Data & Excon	45	Frontenac C/A/B
17:30	End of day 2		
INTERMAGNET dinner			
18:00	At the "Blue Cactus Bar and Grill", 2 Byward Market Square, Ottawa, K1N 7A1. http://www.bluecactusbarandgrill.com		

Day 3: Monday, July 22, 2019			
Plenary Session Reports			
9:00	Report on IMOs: C Turbitt	40	Frontenac A
9:40	Report on definitive data timeliness: J Reda	15	Frontenac A
9:55	Future of the INTERMAGNET web site and data archive: S Flower, C Blais	15	Frontenac A
10:10	INTERMAGNET's relationship with SuperMag: A Thomson	10	Frontenac A
10:20	Free slot	10	Frontenac A
10:30	Coffee	30	
11:00	Reports, decisions and action item lists from subcommittees	45	Frontenac A
11:45	Report, decisions and action item list from EXCON	15	Frontenac A
12:00	Review and agreement on decisions and action items from plenary sessions	20	Frontenac A
12:20	Date and place of next meetings: 2020 - Offer from Kazan, Russia; 2021 - Offers from Hyderabad, India (IAGA = 22nd - 27th August)	10	Frontenac A
12:30	Lunch^[2]	60	

Working Sessions			
13:30	Technical Manual conversion to Markdown, led by C Blais	120	Frontenac A
15:30	Coffee	30	
16:00	Free slot or further Technical Manual work Possible topics: Intro to GitHub; MagPy (Iaga2002 -> CDF conversion, data check functions); imcdview/gm_convert; FSDN	90	Frontenac A
17:30	End of day 3		