36th Directing Board Meeting – Summary Notes

Location: MIT Haystack Observatory, Westford, MA, USA
Date: 15 October 2016
Note taker: Dirk Behrend
Version history: 15 October 2016, 30 January 2017

Attending Board members: Axel Nothnagel (Chair), Dirk Behrend, Alessandra Bertarini, Patrick Charlot, Ludwig Combrinck, John Gipson, Rüdiger Haas, Ed Himwich, Alexander Ipatov, Ryoji Kawabata, Jim Lovell, Chopo Ma, Arthur Niell, Bill Petrachenko, Guangli Wang.

Excused: Torben Schüler.

1. Welcome (Axel Nothnagel)

Axel Nothnagel welcomed the Board members. Torben Schüler could not attend.

2. Approval of Agenda

The Board approved the agenda for the 36th DB meeting.

3. Approval of Minutes of the 35th DB Meeting (Axel Nothnagel)

The Board approved the notes of the 35th DB meeting.

4. IVS DB Chair's Report (Axel Nothnagel)

Activities since the last Board meeting included:

- Finalized the IVS Strategic Plan 2016–2025.
- Wrote letter of endorsement about FAST and sent it to Alexander Ipatov.
- Provided a review of the HartRAO Space Geodesy Programme.
- Held a review interview with NRCan concerning UN GGRF.
- Gave a presentation at ESA in Darmstadt on June 29, 2016.
- Alerted the community to the change in behavior of the IVS vs. IGS x-pole discrepancies from about 2012 onwards.
- Re-initiated a discussion about multi-tone phasecal: At a dedicated meeting it was decided to use multi-tone phasecal as opposed to single tone in the future and to do the changeover at the beginning of 2017.

5. IVS CC Director's Report (Dirk Behrend)

Main activities since the last Board meeting:

- Coordination of the VGOS Trial Campaign
- Preparation of the Master Schedule 2017
- Edited the GM2016 Proceedings. The volume of 414 pages is to be published in the NASA series before the end of the year.
- IVS Newsletter
- Talks and Reports:
  - IVS contribution to the IERS Annual Report 2015
  - Poster presentation at WDS Members' Forum
  - Contribution to Journal of Geodesy paper about IVS
  - Activity report for GGOS Days
  - Talk for GGOS Bureau for Networks and Observations during EGU week (given by C. Ma)

Other activities:

- Notes of the Board meeting in South Africa
- GM2018: brief discussion with host about commercial sponsors
- CDDIS:
  - tested new upload procedure (Web-based)
  - switchover to new procedure for operations still unclear (should have happened in July)
- OPC, VPEG, and VTC participation

The schedule for the DB Elections 2016/2017 was set to:

- Nominations for representative positions due: 16 December 2016
- Representative positions elections: 9–20 January 2017
- Announcement of election results: 24 January 2017
- Nominations for at large positions due: 30 January 2017
- At large elections by Board: 1–20 February 2017
- Announcement of election results: 15 February 2017

6. Short Reports of the Coordinators and Committee Chairs

6.1 Observing Program Committee Chair's report (Dirk Behrend)

Issues discussed in the period since the last board meeting were

- OPC membership: Elena Skurikhina replaced Alexander Ipatov as IAA representative. Chet Ruszczyk from MIT Haystack Observatory augmented the OPC.
- Kokee Park 20-m antenna repair (azimuth bearing):
  - repair period: April 11 through June 6
  - no 24-hour sessions, Tsukuba replaced Kokee in the INT1 Intensives during downtime

- ESA DSN stations: Claudia Flohrer was to inquire at ESA about observing with ESA stations in IVS sessions.
- VLBA (now LBO) observing time: 50% of the VLBA observing time is now financed through the U.S. Navy. USNO is going to manage the time. It is expected that more observing time for IVS sessions will be available. Details need to be worked out.
- VGOS Trail Campaigns:
  - Campaign #1 started on September 20/21
  - Second 24-hour session postponed until October 18
  - Operations not smooth enough at this point
  - Likely a repetition of Campaign #1 in 2017
- Mixed-mode (broadband+legacy) observing:
  - Items: scheduling, stations setup and observation, correlation
  - Westford was tagged along to legacy RD1606
  - Procedure not operational yet: issues in Fourfit due to way DiFX handles missing channels
  - no broadband stations in legacy sessions in first quarter of 2017
- Observing Plan 2017:
  - Plan approved by OPC
  - EURO sessions: two as usual, four at higher rates
- Increased data rates for T2 sessions: change could be done similar to EURO sessions. This was an ongoing discussion.
- R&D sessions in 2017:
  - *Gaia:* six sessions in support of a satellite mission
  - Improvement of scheduling INT1 Intensives: four sessions (carry-over from 2016)
- CONT17:
  - 28 November – 13 December 2017
  - three parallel networks (bulk of legacy stations, LBO + some legacy stations, broadband stations)
  - focus on legacy networks
  - scarcest resource is correlator time
- INT2/INT3:
  - Ishioka to replace Tsukuba in 2017
  - Characterization of "new" baseline in INT2 sessions as well as extra Intensives

Axel suggested to test distributed correlation (under Alessandra's tutelage) using existing IVS sessions, for instance, by spreading the observing hours to, say, four correlators. When doing so, Alessandra should make sure that all correlators used the same parameters. Gino agreed to work with Alessandra on these tests.

6.2 ICSU World Data System (Dirk Behrend)

Meetings:
- SciDataCon 2016
  - "Advancing the Frontiers of Data in Research"
  - Denver, CO, USA

    - 11–13 September 2016
    - Part of International Data Week (IDW) 2016 (11–17 September 2016)
- WDS Members' Forum
    - 11 September 2016
    - http://www.icsu-wds.org/events/wds-events/wds-members-forum

Reporting and Membership
- Activity Report
    - replaced Biennial Report
    - every two years
    - fill-in of questionnaire
- Membership
    - 98 members
    - includes 64 regular and 10 network members
    - geographical distribution map looks quite similar to IVS components map
    - expansion into Africa and South America a priority

(Re-)Certification and Bylaws
- Certification
    - to be done by regular/network members (was done by WDS Scientific Committee)
    - every three years
    - basis: Catalogue of Common Requirements from DSA-WDS for regular members; existing catalog for network members
- Bylaws
    - Updated with more restrictive data policy
    - no impact on IVS

6.3 Technology Coordinator (Gino Tuccari)

Current Status of Documentation
- VGOS (VLBI2010) specifications: main documents existing on IVS Web site
- VDIF standard definitions: looks adequate for the current needs, developers will be asked for any possible further requirements
- Tables of existing VGOS equipment: under way, a lot of information in the IVTW, to be collected, agreed with the originator and published on dedicated Web pages
- VGOS stations in the field and under construction: a lot of information during the IVTW

Create dedicated Web pages under the IVS Web site (under preparation):
- with information about or links to operational VGOS stations
- with information about or links to VGOS stations under construction

Documentation required moving forward:
- Guidelines for antenna requirements
- Guidelines for data transmission from receiver to control room

- Guidelines for common features in DBE

Observational steps forward
- Continue to test new stations in VGOS mode
- Transition from 8 Gbps to 16 Gbps
- Transition from 16 Gbps to 32 Gbps

6.4 VGOS

6.4.1 VGOS Technical Committee (Jim Lovell)

VTC activities since the last Board meeting:
- *Monthly telecons.* Good participation.
- *Test/trial observations the main focus.* GGAO, Westford, KPGO, Wettzell, Yebes, Ishioka.
  - Has helped improve operations, debug new systems (DBBC2 PFB firmware).
  - Mixed mode. Correlation, post-processing procedures.
  - Dynamic observing tests ongoing.
- *Progress at other sites.* Onsala Twin Telescope (first light in November), Shanghai (mid-2017), HartRAO (2017), AuScope (upgrade mid-2017).
- Issues:
  - Caltech QRFH. Thermal cycling causing probes to move?
  - Multi-tone phasecal. Meeting yesterday.
  - Monitor, control.
  - Mark 6 / e-transfer.

6.4.2 VGOS Project Executive Group (Hayo Hase)

Incremental Update:
- Telecons:
  - 16-07-12 VGOS Analysis Plan postponed, waiting for VGOS experience
  - 16-09-13 e-transfer versus module shipping, some stations prefer e-transfer rather than buying/shipping modules

6.4.3 Observatory monitoring and control (Jim Lovell)

VGOS Operations
- Who will lead the production of a VGOS operations concept?
- A VGOS Operations concept is needed (e.g., control center)

Monitoring and control, operations
- Recent work at Goddard (Dave Horsley's presentation at IVTW)

- UTAS Dynamic observing tests and demonstrations. AuScope, Hartebeesthoek, Onsala, Medicina.

6.5 Network Coordinator (Ed Himwich)

Mario Bérubé joined the Goddard group in June 2016 working remotely from Ottawa.

Data Yield 2016 (based on the first three quarters of the year)
- Results through September 30
  - 105 of 117 sessions correlated
  - 1263 station days so far
- Overall correlator yield by stations about 88%
  - In line with historical yield of 85–88%
  - 3.3% of loss due to antenna problems
  - 2.6% of loss related to RFI
  - 1.0% of loss related to receiver issues
- Overall data used by analysts: 70%
  - Loss at one station affect more than one baseline
  - Includes other issues detected by analysts

A table of Most Used Stations (>10 sessions in three quarters of year) listed 25 stations with their number of observing days, the observing issues they encountered, and their data yield. About half of these stations had yields in the mid-90% and higher range. The upper echelon (about one third) observed 60–80 session days, whereas the majority was in the 15–30 session-day range.

The Least Used Stations (≤10 sessions) listed 15 stations, where about half observed three sessions or less. The data yield for these stations was on average less than for the Most Used Stations; the data yields were mostly in the 60–80% range.

In summary, the station performance could be considered pretty well; anything above about 80% yield would have to be considered as very good. The largest losses were not due to station operations but rather because of antenna and receiver issues as well as RFI.

Coordination issues
- Clock "summit" needed
  - Review and reinforce consistent handling of station clock offset data by correlators
  - Hybrid S/X and VGOS observing is important to maintain common reference
- Correlator coordination
  - Set standards: software, formats, clock offsets
  - e-transfer coordination

VEX2
- Standard and parser are almost finished
  - not an obstacle, only minor issues remain
- We need writers

  - SKED: target first half of 2017
  - sched: the same?
- Stations
  - FS/DRUDG – targeting first half of 2017
  - VLBA – tbd
  - Others – tbd
- Correlators
  - SFXC (JIVE) – targeting first half of 2017?
  - DiFX – tbd

6.6 Analysis Coordinator (John Gipson)

The IVS Bibliography list should be available online in the week after the Board meeting.

Transition to ITRF2014: Brian Luzum asked when the IVS would transition to using ITRF2014. The IVS basically was ready to do the transition: Sabine Bachmann was ready with the combination and Calc/Solve was set up as well. John suggested to set a fixed date, e.g., December 31, 2016 as the transition date.

We are in the golden age of VLBI analysis software: ASCOT from Bonn; VieVS internal version can use vgosDB and satellite data; VieVS@GFZ can use vgosDB; Geosat is being redone from scratch.

6.7 Committee on Training and Education (Rüdiger Haas)

The 2nd IVS Training School on VLBI for Geodesy and Astrometry was held in South Africa. In the grading of the school by the students, all students stated unanimously that they improved their knowledge.

Evaluation summary:

- The best: exercises, the complete picture, running an experiment, well prepared lectures, enthusiasm of several teachers.
- The worst: program too tight, too long days, some lectures too technical, even better coordination between lectures required, external experts needed (e.g., geophysicists).
- Suggestions for improvements: longer and more exercises, connect better to participants background, more structure and highlighting, gender balance for teachers, invite external experts from outside of VLBI, small tasks/tests for the students.
- Outlook for future schools: better coordination among the teachers, more homogenous (e.g., notation), shorter lectures, more exercises.

7. Short Reports of IVS Working Groups and other IVS assignments

7.1 WG7 on Satellite Observations with VLBI (Rüdiger Haas)

Sub-WG-1 (ToR-1):
- Topic: "Technical issues"
- Chairs: Jan Kodet and Ed Himwich
- Members: James Anderson, Yoaz Bar-Sever, Alexander Neidhardt, Rüdiger Haas, Thomas Hobiger, Younghee Kwak, Ulrich Schreiber, Geshi Tang, Jens Wickert

Sub-WG-2 (ToR-2):
- Topic: "Scheduling and simulations"
- Chairs: Andreas Hellerschmied and Lucia Plank
- Members: James Anderson, John Gipson, Rüdiger Haas, Robert Heinkelmann, Thomas Hobiger, Grzegorz Klopotek, Li Liu, Tobias Nilsson, Jing Sun

Sub-WG-3 (ToR-3):
- Topic: "Correlation"
- Chairs: Laura La Porta and Simon Casey
- Members: James Anderson, Alessandra Bertarini, Yuri Bondarenko, Rüdiger Haas, Thomas Hobiger, Axel Nothnagel, Sergei Pogrebenko

Sub-WG-4 (ToR-4):
- Topic: "Analysis"
- Chairs: Benjamin Männel and Thomas Hobiger
- Members: Robert Heinkelmann, Grzegorz Klopotek, John Gipson, Rüdiger Haas, Tom Herring, Tobias Nilsson, Li Liu, Markus Rothacher, Vincenza Tornatore

Activities so far:
- Formed sub-WGs for the four ToRs
- Participation in E-GRASP proposal
- Had a first face-to-face meeting in connection with the "First International Workshop on VLBI Observations of Near-Field Targets", Bonn, 5/6 October 2016

Next steps:
- Sub-WGs continue and document their work
- Next face-to-face meeting in connection with EVGA 2017

7.2 Task Force on IVS Intensives (Rüdiger Haas)

No activity since last DB meeting. It was anticipated to have the final Task Force Report ready by the Board meeting in Gothenburg in May 2017.

7.3 Task Force on Seamless Auxiliary Data (Alexander Neidhardt)

Alexander Neidhardt reported no progress since the last DB meeting. However, he stated that Wettzell was a partner in the accepted EU project "Jumping JIVE" which includes funding for a two-year position for the implementation of seamless data archives (with focus on JIVE but also for IVS).

7.4 Working Group 8 on Galactic Aberration (Dan MacMillan)

The WG was following up in areas of investigation of the galactic aberration vector (GAC) discussed at the first WG8 Meeting in South Africa:

- Several estimates of GAC (including new VLBI estimates):
  a) global solution estimates: two independent Calc/Solve (+ new versions of previous solutions) and VieVS (new solution soon)
  b) estimates from source time series proper motion (one Calc/Solve + one new Calc/Solve)
  c) independent estimates based on parallax measurement
- Investigated sensitivities of the global solution estimates to different analysis strategies (e.g., different time periods, data decimation, and source selection).
- Investigated sensitivities of parameter estimates (EOP, TRF, CRF) to aberration to be able to answer the question of how large an uncertainty in aberration can be accepted.
- Expect to have a GAC recommendation prior to the EVGA 2017.

8. Reports of Action Items of Last DB Meeting (all)

There was no work done on a Memorandum of Understanding between the IVS and the EVN.

A letter of support for FAST was written and sent.

The report of the Task Force on IVS Intensives was still work in progress.

No work was done on checking the status of IVS stations w.r.t. ITU registration.

9. Acknowledgements of telescopes and correlators (all)

We can request to make use of the registered DOI for the IVS contribution to ITRF2014. The next step could be the registration of results from individual analysis centers.

The journal *Scientific Data* (http://www.nature.com/sdata) is a peer-reviewed, open-access journal for descriptions of research data sets. This is an avenue to publish papers about data.

A special issue on reference frames was in the works in Journal of Geodesy.

10. Marketing, outreach, public relations (all)

The work on the tri-fold(s) should be revived.

11. Safeguarding VLBI observing frequencies/CRAF (Hayo Hase)

There was no report submitted before the meeting.

12. Items related to IAG, IAU, WDS, and related VLBI groups

12.1 IAG

12.1.1 Commission 1 and Sub-Commission 1.4, Commission 3 (Ludwig Combrinck)

An IAG Retreat was held in April and a Strategic Plan was launched. One of the issues identified was visibility. Most work was done on a best-effort basis. There did not seem to be an obvious solution. A dedicated group was needed to tackle this problem. The Geodesists' Handbook was published in Journal of Geodesy.

12.1.2 Newsletter contributions (Dirk Behrend)

The report about the 2nd VLBI Training School, written by Frank Lemoine for the IVS Newsletter, was also published in the IAG Newsletter and the IAG News section of the Journal of Geodesy.

12.1.3 GGOS (Axel Nothnagel, Dirk Behrend)

GGOS Days were to be held ten days after the Board meeting at the Center for Astrophysics (CfA) in Cambridge, MA, USA.

12.2 EVGA (Rüdiger Haas)

EVGA working meeting in 2017

- 15–19 May 2017 in Gothenburg @ Chalmers
- Connected with the inauguration of the Onsala Twin Telescopes
- 1st Announcement: 1 March 2016
- 2nd Announcement: 1 November 2016
- Abstract submission and registration opens: 1 February 2017
- Registration: 1–15 March 2017

- http://www.chalmers.se/en/conference/EVGA2017

EVGA 2017 (timeline)
- Sun May 14: Icebreaker
- Mon May 15: EVGA Day 1
- Tue May 16: EVGA Day 2
- Wed May 17: IVS Analysis Workshop and splinter meetings
- Thu May 18: OTT inauguration
- Fri May 19: IVS Directing Board

EVGA 2019
- search for candidate ongoing
  - no written statement of interest yet
  - has to be decided before EVGA 2017
  - should also host 3rd IVS VLBI School

12.3 Asia-Oceania VLBI Group for Geodesy and Astrometry (Jim Lovell)

Observing program:
- Six sessions in 2016
  - 1 Gbps where possible
  - Four sessions correlated and released
- Six sessions in 2017
- Sharing of scheduling and correlation between GSI, SHAO, UTAS, NGII (validation)
- Communications and collaboration working well

Outlook to 2017:
- Next AOV meeting in Kobe, Japan to coincide with the IAG and IASPEI Joint Scientific Assembly, August 2017. Discussions under way with IAG LOC.

12.4 IERS (Chopo Ma, Rüdiger Haas, Axel Nothnagel)

Gerard Petit was unable to continue to contribute as in the past. Paris Observatory would take over half of the portion of the Conventions (move of half of Convention Center from BIPM to OPAR). For ITRF2014 only very few sessions (according to Z. Altamimi) were not included in the ITRF2014 computations, including the early domestic Japanese sessions and the single baseline sessions. A DTRF solution is available from DGFI; there is no scale difference between SLR and VLBI in the DGFI solution, which has a different concept for the computations as opposed to the IGN solution. There is a Kalman filter solution from JPL, where about 25% of the IVS data were taken out (mostly the regional sessions).

12.5 IAU

12.5.1 IAU Division A (Patrick Charlot, Chopo Ma)

IAU Division A

- Proposal for a symposium on reference frames at the next IAU General Assembly (Vienna, 27–30 August 2018)
  - ICRF3 and celestial reference frames and systems, Gaia and the link between optical-based and radio-based celestial reference frames and systems, terrestrial reference frames and systems, Earth rotation, fundamental standards
  - Proposer: Richard Gross
- Also a focus meeting on Gaia science

12.5.2 ICRF3 (Patrick Charlot)

Detailed work plan until 2018 established

- 01/09/2016: prototype ICRF3 solutions
- 01/07/2017: pre-final ICRF3 catalogs
- 01/01/2018: final ICRF3

Identification of all issues to be addressed in the work (e.g., source position stability, transfer sources ICRF2–ICRF3, Galactic aberration)

Prototype catalogs (09/2016)

- Six solutions at S/X band
- One solution at X/Ka band
- One solution at K band

Working Meeting: 17–18 October 2016 at Haystack

First Gaia Data Release (DR1)

- First Gaia data released on 14/09/2016
  - 1 billion star atlas
  - 2 million star proper motions and parallaxes
  - Positions for 2200 ICRF2 quasars

Optical-radio position differences:

- better agreement with ICRF2 defining sources
- agreement < 10 mas for 94% of all sources (98% of the defining sources)
- agreement < 1 mas for 44% of all sources (71% of the defining sources)
- differences generally consistent with the combined ICRF2 and Gaia position uncertainties
- among the sources with the most precise radio and optical positions, *there is no indication of physical optical-radio offsets exceeding a few tenths of mas*

12.6 EVN (Patrick Charlot)

13th EVN Symposium
- 127 participants
- Scientific topics: Life cycle of matter in stars and galaxies; AGN and cosmic star formation; Extreme astrophysics; Astrometry, Geodesy and Planetary Science; Techniques and developments in VLBI.

Funding
- RadioNet - H2020 approved
  - EVN Trans-National Access
  - BRAND Joint Research Activity
- JUMPING JIVE approved
  - Strengthen the ERIC structure
  - Add possibility of geodetic correlation
  - Scheduling

Partners
- Irbene to join the EVN
- Latvia to join JIV-ERIC

13. Highlights of recent meetings (all)

First International Workshop on VLBI Observations of Near-field Targets: 55 participants, lots of discussion

The IVTW went very well. There was a good cross-section of geodesy and astronomy present.

14. Upcoming Meetings

Ryoji mentioned that there would be two meetings in Japan. The IAG and IASPEI Joint Scientific Assembly (with an AOV meeting) will be held in Kobe from 30 July – 4 August. A JpGU–AGU Joint Meeting will be held after the EVGA meeting from 20–25 May 2017 in Chiba; the meeting will include a GGOS session.

15. Summary of Action Items

There were six action items resulting from this Board meeting (separate document).

17. Miscellaneous (all)

None.