

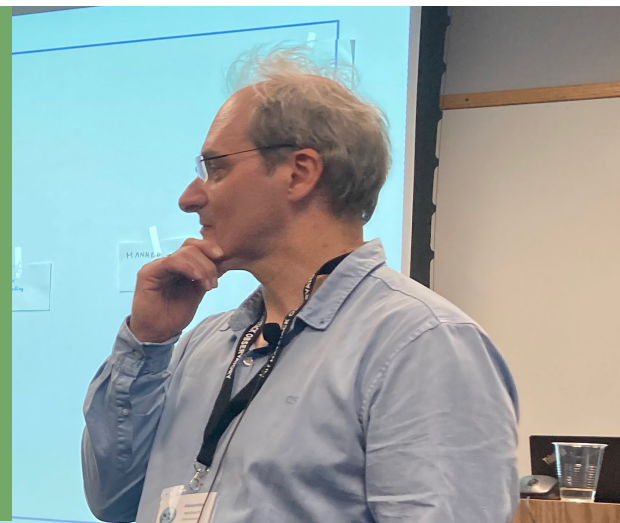
IVS NEWSLETTER

ISSUE 66, August 2023



Getting Personal Again

The months of May and June have seen a slew of IVS-related meetings, such as the TOW, EVGA, IVS Retreat, and Analysis Workshop, just to name a few prominent ones. A common feature of all these meetings was that they were largely organized as in-person events. Following the hiatus of face-to-face events due to the coronavirus pandemic, the personal interaction was an essential part of the success of these meetings and the participants took full advantage. Seeds were sown for new ideas and future collaboration. Here's to a successful harvest!



IVS 2023 Retreat

Dirk Behrend
NVI, Inc./NASA GSFC

The IVS Directing Board plus six invited guests held a two-day retreat in Bad Kötzing/Wetzell, following the EVGA meeting, on June 16 and 17. This was the third such event, after similar undertakings in 2011 and 2015. A stakeholder meeting in conjunction with the 2020 General Meeting didn't pan out because of the pandemic. As a pathfinder event, the Retreat stood under the motto "Quo vadis IVS?"—looking for pathways into the future.

On the first day, the twenty-three participants reviewed the existing strategy documents, discussed material requested from parent organizations and sister services, and addressed select topics including frequency management, K-band CRF, and transition planning from S/X to VGOS. On the second day, the focus was on small group work followed by a deliberation in the entire group of five specific questions (IVS focus during 2025–2035, approach to frequency management, VGOS CRF, enhanced professionalism, and the handling of GENESIS).

Inside this issue

Getting Personal Again	1
IVS 2023 Retreat	1
New Network Coordinator Alexander Neidhardt	2
TOW2023: A Personal View	6
PFMED for Dummies	7
August Network Report	8
IVS Outreach Site	9
EVGA Held Successfully in Bad Kötzing	10
Report on 24th IVS Analysis Workshop	12

The retreat resulted in several recommendations for the IVS Directing Board, which the Board used for actions and decisions in a subsequent meeting. The planned actions include the preparation of a VGOS roadmap in the time leading up to the next General Meeting as well as the formulation of a transition plan from the legacy S/X system to VGOS. The anticipation is that these documents will help future funding decisions.

New IVS Network Coordinator Alexander Neidhardt

In January 2023, Alexander Neidhardt from the Geodetic Observatory Wettzell took over the role as IVS Network Coordinator from Stuart Weston. Being in the field since 2008, Alexander is well known among the IVS stations as well as in the larger IVS community. Newsletter editor Hayo Hase interviewed Alexander via email, learning more about his background, his vision for the coordinator's job, and recent activities. Here an excerpt of the exchange, slightly edited for clarity.



Alexander Neidhardt in his office at the Geodetic Observatory Wettzell.

Alexander, your career started in computer science. How did you get involved in geodetic VLBI?

I studied Computer Science at the Friedrich-Alexander-University Erlangen-Nuremberg with a clear goal to work in industry for the upcoming broad field of mobile phone technology. My background is in the automation of hardware and software co-design. Because I wanted to obtain a PhD, I kept my eyes open. At this time, I received a phone call from the observatory where I earned my pay as a student. The former head of the observatory, Dr. Schlüter, surprisingly offered me the chance to do a PhD residency in Geodesy at the Technical University of Munich. I jumped into a new field of working for GPS but with a focus on automation of these geodetic sites.

After my PhD, I continued at Wettzell working for SLR, designing the automated control system for new laser stations. But I also started with my post-

doc lecturer qualification with giving first lessons about Applied Computer Science (see latest course in YouTube https://www.youtube.com/channel/UCRMNwJU7eCSWuXoCgC_2NNw). In 2008, the former head of the VLBI group retired and I became his successor—despite not being at the top of the list for that job due to my lack of experience in VLBI. But my boss at the TUM wanted a broader work field filled by the new head of VLBI at the time. This was my luck and I started with geodetic VLBI.

Do you remember your first time running a VLBI session as a newbie? How was that for you?

I really started as a newbie. I never had had an extensive contact to this technique before. The computer scientist in me had to learn the RF aspect, the mechanical side of the large equipment, the cryogenics part, and much more. This was a rocky road. But I had some fantastic colleagues. Especially Christian Plötz, who mainly was responsible for the Antarctic site O'Higgins, explained many details to me in a very elementary and open way. It started a friendship which still plays a key role in keeping the team and system going through structural and administrative changes. Additionally, I directly felt welcome in a global community that works together. Workshops like the TOW at Haystack were essential to see and learn new things and was instrumental in meeting people doing the same work all around the world.

Based on your numerous experiences you wrote a book titled "Applied Computer Science for GGOS Observatories." What is this book about?

The book was something like a second PhD thesis, called "habilitation." If you want to become a professor in Germany, you have to show additional lecturer qualification. This relates to the title Dr. habil., an additional degree in Bavaria showing that you are not only able doing science but also good at teaching. Additionally, I always wanted to write a book and publish it in a series with a renowned publisher. The focus of my daily work and teaching was on automation using techniques of applied



Alexander inspecting the photogrammetric markers in the antenna.

computer science. So, it was easy for me to pack experiences made in Wettzell about this into a book. As I started with the design of control systems for laser ranging systems, a main chapter explains the ideas which finally were implemented at one of the systems at Wettzell. Another main chapter is about the remote control and automation of VLBI systems with aspects of Internet security. And here is also the importance that we need coordination, communication, and automation. The whole system is just as good as the smallest chain link. Therefore, I see GGOS and the technical implementation of its parts, like VGOS, in comparison to the Fourth Industrial Revolution (Industry 4.0).

You had been active in the realization of the IVS Seamless Auxiliary Data Archive (SADA), a long-standing request from analysts to network stations. Could you summarize what it is for?

The IVS SADA has a long history by now. The idea started with a task force founded at the 2014 General Meeting in Shanghai. It was proposed that continuous auxiliary data may improve data quality. Instead of theoretically defining possibly required data for analysis, I wanted to implement an infrastructure to use already existing data. The NASA Field System already contains hundreds of values which could have been used. I therefore started with a development to collect, present, and offer such auxiliary data seamlessly in a simple way. Because EVN had similar issues, we also received funding for such developments. The result is the EVN monitor and the IVS SADA. These systems are databases based

on the monitoring software ZABBIX having simple injector programs, and a Web GUI to view and extract data. Sites get accounts and can send in values with predefined identifiers (e.g., all values shown in the System Status Monitor of the Field System) without installing software on their machines. The Web GUI offers instant graphs. But it can do much more: it also shows a world map with status information, allowing to track the health of participating observatories in real-time. Analysts can download continuous and seamless data sets according to their needs using a Python script. Further info can be found in this video: <https://youtu.be/xh43CzQce60>.

Recently you have been elected as the new IVS Network Coordinator, which is a very important role within the IVS. The Terms of Reference lists four functions: monitor of adherence to standards, tracking of quality and improvements, and coordination of software development. How do you do that?

Well, things are changing now. New techniques arise while implementations are very specialized and mainly done by small companies or universities. National interests and additional domestic tasks are challenges in a changing world with war and sanctions. This means it becomes more and more complex. Therefore, it is essential that we come back closer to the individual needs at the sites. My idea is to regularly get in contact with station staff, requesting feedback and input, and bringing this to the IVS Directing Board and other committees. At this year's TOW, I organized an interactive discussion board that worked well to collect information for the

decision bodies. An important part is to re-establish centralized information archives as a collection of documentation and contact data, where I strongly support ideas like GitHub. Another goal is to automate the extraction of quality data using existing but also new programs.

Where do you see shortcomings in the IVS station network? What are your objectives?

The contributors become more and more heterogeneous. Many competing tasks within the different institutions must be brought under one umbrella. VGOS has many technical challenges and the fast-changing world, with its hunger for communication, changes the RF use for VLBI. The IVS currently has no lobby or powerful advocates to force the protection of its global interests. It is more or less a loose connection of successful partners. I think that there are no general answers, but I see the IVS potential more in a strong community. So, scientific proposals should be requested with a strong connection among the IVS members—and not just with a focus on individual institutions. We should listen more to the engineers and the basis at the sites to get a stable and trustful foundation for the new techniques.

For sure, VGOS is the most challenging endeavor of the IVS. However, we still do not have met all VGOS specifications in practice. What are your ideas to progress from the status quo to a better performing VGOS network?

I think this question should be better addressed to the Board as a panel or to managers at the site having responsibility for finances. Most of the issues are related to individual implementations costing a lot of money. Where I can jump in is to support mediation between the different parts of the IVS and between sites. I can take problems and issues from the sites into discussions to the Board. Collecting information

and bringing people together to find solutions might be another personal support. But it is also essential to focus on implementations which are already possible and affordable also in operation. I still see automation as an important key role to simplify day-to-day business and produce a standardized workflow.

While we try on a best effort basis to improve the VLBI quality, we notice that upcoming telecommunication services on the ground (5G, 6G, Wi-Fi) and in space

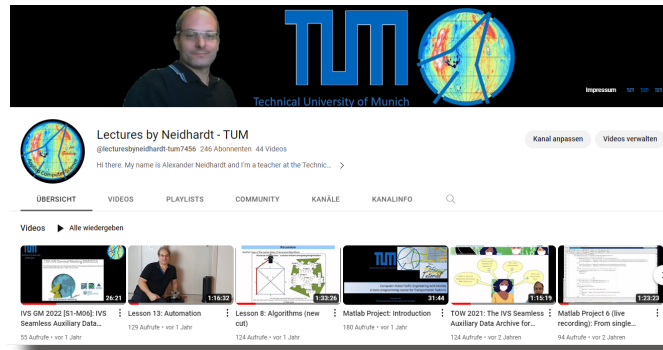
(Starlink, OneWeb, SAR-missions) threaten the global VLBI network. How do we improve the situation at network stations or in general?

Although we have a very comfortable situation at Wettzell with new coordination zones and a good support by regulation authorities, we still have large impacts

by LTE and other emissions. It is really a growing problem. Therefore, I see several layers to deal with it: on top is lobbying work at regulation authorities and governmental environments to increase the visibility of needs for the important geodetic work and its protection. This must be triggered by the sites and management at the observatories in their countries. On a lower level, the IVS has to coordinate new frequency setups. We should not just think of keeping the VGOS bands as they are. Finally, there are technical solutions. A simple way is to implement horizon masks, which has minor success. More difficult are new types of filters in the chain, where impacts to products are not completely understood and development is related to specialized groups. So, there are many uncertainties, I'm afraid.

The link between all network stations is to run the VLBI sessions since ever the use of the Field System Software. Which future developments of the FS can be expected?

This is a big concern of mine, maybe not in the near-term but in the long-term future. We have many current and looming retirements in this field. On



A new field is the YouTube channel with Alexander's lessons.

the one hand, the market for software developers has been fished empty, especially if you compare earnings in science and industry. On the other hand, the “zoo” of individual equipment in VLBI and at the stations increases. There are now several attempts at different places with implementing new control systems. My concern is that they have to keep their budget in mind, so that new developments for other institutes will be difficult. Another aspect is that new implementations have new errors and that developers usually just see their own environment. I fear we have to leave the comfortable use of a single standard system, like the established NASA Field System. We will have to focus on the definition of interactivity and communication standards instead.

Finally, if spare time is left after all your duties, what are your favorite leisure activities?

Well, I bought a nice piece of land with grassland and a small forest. Working there is a good compensation of my daily business. I also like producing handmade things and craft activities. But what I really enjoy is to have a few hours or a day off with my family, just focusing on nothing else. Holding my daughter in my arms or seeing her dancing traditional Bavarian dances are the short moments when everything is perfect.

Thank you so much for your time, Alexander.



Alexander leading through the TOW2023 “Discussion Board” session with station personnel and others.



Here’s to a successful time as Network Coordinator!

Meetings

Journees 2023
Nice, France
September 11-13, 2023

15th DiFX Users and Developers Mtg
Socorro, NM, USA
September 11-15, 2023

GGOS Days 2023
Yebeas, Spain
September 20-22, 2023

ITU World Radiocomm. Conference
Dubai, United Arab Emirates
November 20 - December 15, 2023

AGU Fall Meeting
San Francisco, CA, USA
December 11-15, 2023

Thirteenth IVS General Meeting
Tsukuba, Japan
March 3-4, 2024

EGU General Assembly 2024
Vienna, Austria
April 14-19, 2024

45th COSPAR Scientific Assembly
Busan, South Korea
July 13-21, 2024

IAU XXXII General Assembly
Cape Town, South Africa
August 6-15, 2024

TOW2023: A Personal View

Giuseppe (“Pino”) Colucci
Matera Space Center

From April 30 to May 4, 2023, I attended the 12th IVS Technical Operations Workshop (TOW2023), which was once again held at MIT Haystack Observatory. As you can see looking at the certificate of completion from 2001, this was not my first TOW. Therefore, at my age, I could easily start to think and remember with nostalgia when I started my work in VLBI. I can try not to do this... but probably later I will. Anyway, my main goal here is to try to explain why, in my opinion, TOWs are so important.

First of all, for technical reasons. Generally speaking, things change so quickly right now. It is true that everyone can find almost anything on the web, but there are important differences with new technologies in the VLBI field.

Changes must be done in cooperation, and all equipment, old and new, must coexist. So, it is very important to have the opportunity to share ideas and new designs. Teaching and learning in person are powerful in spreading information, and so is it to have feedback from people that are going to use the tools. This time, I had a precise target as a new VGOS antenna is being built at my station. For that, I was particularly interested in VGOS equipment and operations; and, of course, I had the opportunity to learn a lot of new things.

TOWs are important for new people involved in VLBI. I remember when I started to work at Matera Station (yes, that’s many years ago now). It was not so easy to find documentation and manuals, especially for people like me that had no VLBI or astronomy background. TOWs helped me a lot. I

remember a couple of times I had some difficulties to put the “paper” notebooks into my baggage. But I had to, simply because I needed those notebooks. And now? We do not have the “paper problem” anymore, but I think that new people approaching VLBI have many advantages by talking to experts in person. From this point of view, my impression was that at the last TOW the average age of participants was lower than in the past. I am very happy about this, also because this means that

new approaches to solving old problems are coming.

There is also another reason why I enjoyed a lot my TOW participations. Believe me, the sense of community in our VLBI colleagues is very high. Also, from this point of view, meeting people in person is an incalculable added value. From the very beginning, I always had the feeling that, if I needed

something, someone would be there to help me. The friendly environment during those days made everything easier. The language barrier is not a problem. I still need to improve my English, but after many years I know that this is not an issue: people understand me, I understand people, and this is enough.

As I told you in the beginning, I became a bit nostalgic. But this is what I really think. And, as a final note, especially for young people, there was life before TOW. The name was different, but the spirit was the same—see the certificate from 1998. And I am not sure whether this was the first one!



The participants of TOW2023 on May 1, 2023. Author Pino Colucci is to the furthest on the left in the red jacket.



A few Certificates of Completion from the Chiefs and TOW Meeting over the years.



Alex Burns (right) teaching an operations class at TOW2023.

PFMED for Dummies

Alex Burns
MIT Haystack Observatory

The Field System runs on a Linux computer. If you, like me, have never used Linux before working on VLBI operations, it can be a steep learning curve! One of the ways that Linux differs from a Windows computer is how files are viewed and edited. On Windows, if you have a typical .txt or even a .doc file, you have maybe one or two options to either view or open it. You could open the Windows programs Notepad or WordPad, or the Word or OpenOffice program for .doc. There are not too many choices to make, and you can view, edit, and save files in one place. In Linux, there are many choices, and often more than one correct answer.

It can feel confusing, and you may be tempted to transfer the file to a Windows computer to use a familiar editor. However, you should not edit Linux files with Windows. Text files in Windows often have characters that are automatically hidden by Windows programs related to formatting (such as carriage returns and line feed). When you bring these files back to a Linux system there could be extra “garbage” characters at the start of each line that may cause problems. So, learn to view and edit files the Linux way.

You can list file contents with *cat*, read sections with *less* or *more*, read the beginning or end of a file with *head* or *tail*, and yet none of these commands will allow you to modify the contents! To edit a file, you have to use a text editor, and they are plentiful. *Nano*, *emacs*, *pico*, *vi*, and *vim*, to name a few. Each has its own set of commands and shortcut keys to learn. Read the manual pages for the editor you choose. However, if you want to modify a procedure file in the Field System, you only have to start one program: PFMED. PFMED handles the files gracefully, even files that are open in the Field System, without corrupting the file and creating errors in the Field System. It is really important to only use

```
pfmed:??
? Same as help.
?? Same as help.
:: End pfmed.
dl Display procedures in active library.
ds Display procedures, sorted.
ed[,proc] Edit proc with program in EDITOR variable.
edit[,proc] Same as ed.
emacs[,proc] emacs editor.
ex End pfmed.
exit End pfmed.
he Same as help.
help Display this help text, same as: ?, ??, he.
li,proc List a procedure.
pf,lib Set active procedure library.
pfcrl,lib Create procedure library.
pfdl Display procedure libraries.
pfp,lib Delete procedure library.
pfrn,old,new Rename procedure library.
pfst,old,new create procedure library.
pu,proc Delete a procedure.
qu End pfmed.
quit End pfmed.
rn,old,new Rename a procedure.
st,old[:lib],new copy a procedure.
vi[,proc] vi editor.
pfmed:
```

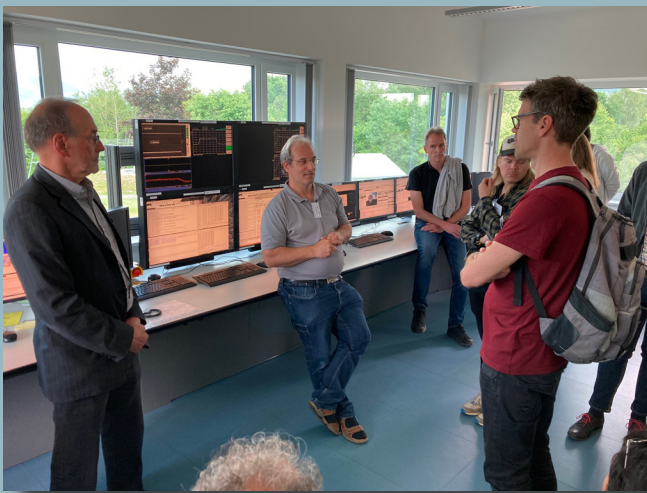
PFMED help information.

PFMED to edit procedures as there is an internal library structure that PFMED maintains. PFMED allows you to use different editors to modify the files, or uses the default editor specified in your `/usr2/oper/.profile` file. When you edit a procedure, typing “vi” gives you vi, “emacs” gives you emacs, and “ed” gives you whatever your EDITOR variable is set to. See the attached PFMED help information and a sample of the Westford .profile contents to give you an idea of what you can do in PFMED.

August Network Report

Alexander Neidhardt
IVS Network Coordinator

Hello to all contributors of the VLBI network. As the new Network Coordinator, I'm pleased to start with a new idea of giving feedback to the community by regularly reporting in the IVS Newsletter. The idea behind this is to explain current work packages, to mention currently ongoing discussions, and to give feedback about issues that came up.



Alexander in the Wettzell operations room (framed by current and former IVS chairs) during the EVGA field day.

Therefore, the first report should show findings that came out of the Discussion Board (feedback session) at the TOW 2023. These findings were presented at the IVS Retreat in Bad Kötzting in June. At the mentioned TOW class, I tried to stimulate the participants to talk about current issues in their work field in a playful manner. I used the class whiteboard to create a two-dimensional matrix on which to place brief statements about challenges, problems, and issues. The placement was determined by categories: contributor or IVS on one axis and technical or administrative on the other. Each participant was allowed to position a single sticker with a statement on the highest priority for their daily work. The resulting matrix can be used to

define new requirements and implementations or to hint at a need for direct interaction. I plan to combine all findings in a memo/paper for publication within the IVS.

A first evaluation revealed challenges for technology at the stations and activities focusing on hardware solutions for RFI mitigation. An administrative challenge on the station side is to obtain funding and to budget for expensive hardware and operations. An administrative task for the IVS should be to offer archives with station details. In general, stations have a lack of spare parts, and the IVS has a lack of documentation.

A clustering of similar topics can be summarized under the following headings: documentation, feedback, (inter-)operability and interaction, data transfer, reliability and operability, quality, VGOS implementation, outreach, and, finally, regulation and responsibility. Combining these clusters into a heat map where single challenges get a higher priority if they belong to more than one heading give a clearer picture: money and the zoo of equipment are the main challenges. Software liability and quality subjects follow suit.

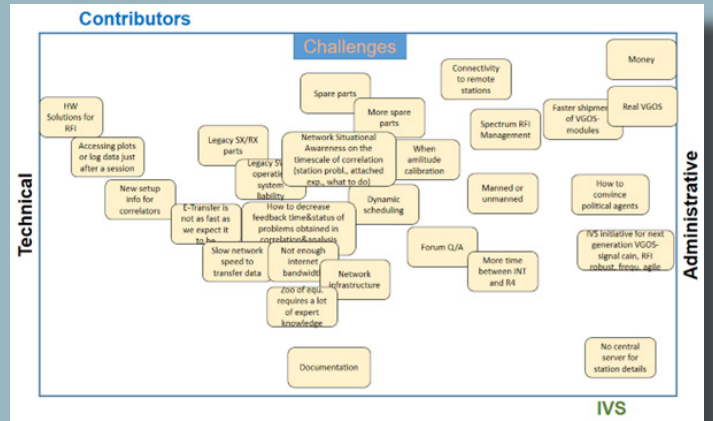
Therefore, the following suggestions were made at the IVS Retreat:

- Coordinate use of web services for dynamic and static IVS information.
- Discuss technical future w.r.t. RFI.
- Discuss funding opportunities at the IVS community level (common funding requests).
- Discuss structure of IVS (dedicated service products, more proposal-based R&D).
- Discuss standardization and optimization of workflows and feedback.
- Discuss marketing and outreach (scientific and public) possibilities.

Some issues can be solved in the near term, like allowing more time for session changeovers. Others require development work and implementation of public web services in networks with increasing security requirements. Beyond the Discussion Board, the following work items related to network coordination are underway:

- Updating station information: a request will be sent to all stations to update their information.
- Finding solutions for stations with strong RFI (like Santa Maria): handling the loss of entire bands.
- Finding new VGOS frequency sequences: supporting discussions and R&D tests.
- Discussing the need of Start and Stop messages (a survey will be started soon).

In any case, if there are urgent issues or topics, please feel free to send me an email at: alexander.neidhardt@tum.de.



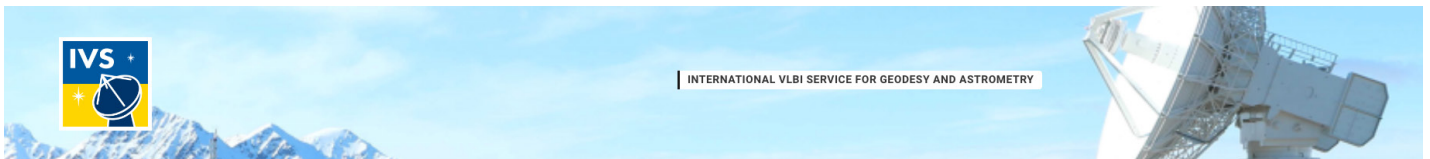
Whiteboard display from the TOW2023 Discussion Board.

IVS Outreach Site

Nancy Kotary,
MIT Haystack Observatory

Take some work selfies! The IVS outreach site, vlbi.org, will be updated soon and we need your help. At the top of the main page is a space for photos of IVS telescopes and facilities. Please look through your work photos and see if there's one you wouldn't mind sharing with the IVS community at large.

The current image is Ny-Ålesund, courtesy of David Mayer. But we'd like to eventually feature all IVS sites, small and large! Please send any suitable images to ivs@mit.edu, and mention the site name and caption for photography credit. And thanks!



EVGA Held Successfully in Bad Kötzing

Shrishail Raut and Susanne Glaser
GFZ Potsdam

Ja, endlich! The VLBI community finally convened in person and Bad Kötzing (Bavarian Forest, Germany) could not have been a better place to host such an event. Nestled in the mountains, just a stone's throw away from our destination, lies the Geodetic Observatory Wettzell—a haven for geodesists. The European VLBI meeting (EVGA) itself took place from June 12 to June 14, 2023. It was followed by an IVS Analysis Workshop on June 15, an IVS Retreat from June 16 to 17, and eventually an IVS Directing Board meeting on June 18. Even though it was a European event, individuals from various non-European countries, such as the USA, Australia, and South Africa, joined in, making it a truly international gathering. The Scientific Organizing Committee (SOC) was made up of eight people, while the Local Organizing Committee (LOC), chaired by Eva Schroth, had five members. About 100 participants attended the meeting, with 46 of them giving oral presentations and 26 making poster presentations. Like the previous meetings, the presentations were categorized under three themes: Technology, Observations, and Analysis.

The meeting began with an icebreaker event held at the Postsaal of the Hotel-Gasthof Zur Post on the evening of June 11, which was attended by most of the participants. The attendees picked up their name badges and we all enjoyed the delectable Bavarian bread and locally brewed beer, which really helped to liven up the atmosphere and make our social interactions more engaging. It was the

perfect way to kick off what was sure to be a productive and enjoyable meeting.

The event commenced with welcoming addresses from EVGA Chair Rüdiger Haas and LOC Chair Eva Schroth. On the first day of the meeting, the network status was discussed with presentations about stations including Ny-Ålesund, RAEGE, AuScope, AGGO, and the Indian space geodesy project “SaptaRishi.” This was followed by presentations about technological topics such as Mark 6, DBBC4, and IVS SADA. After the lunch break, talks were given about the status of the correlators (e.g., Bonn and Wettzell) and analysis software issues. The first day concluded with presentations discussing the VLBI scale drift issue, which is an ongoing hot topic in the VLBI community.

On the second day of the meeting, there were engaging discussions about source structure and topics related to observations. The oral sessions concluded before the lunch break, and after the break everyone gathered to get the official group picture. The floor was then opened for poster pre-



View of Bad Kötzing from the Weißer Regen river.



EVGA meeting in progress.

sentations, which continued until late afternoon. After the long day, most of the attendees proceeded to the meeting dinner at Lindner Bräu, which was within walking distance from the venue. The restaurant is nestled on the edge of a park, and one has to traverse over a little bridge that crosses the Weißer Regen river to get there. The location provided a delightful ambiance for dinner.

Following the dinner event, it was time for the third (and last) day of the conference. The talks began in the morning and the scientific session concluded with a focus on the VLBI observations of satellites. The EVGA meeting came to an end after Rüdiger Haas delivered his closing remarks. After a short lunch, it was time for the excursion to Wettzell. People had various choices this time: a 5-km long hike to the Geodetic Observatory Wettzell via the Planet Trail, a guided tour of Bad Kötzing and the Weißenregen pilgrimage church, the cosmologic exhibition “Faszination Universum,” or the concert hall in nearby Blaibach. Finally, everyone assembled at the Wettzell observatory at around 4 pm where we were served some delicious cakes and coffee for refreshments.

The attendees were split into groups for a guided tour of the observatory. First, we were taken to the twin telescopes, initially outside and then into the control room where they explained the working chain of these VGOS antennas. The observatory also hosts a legacy VLBI station, which has taken part in numerous Intensive sessions along with the 24-hour sessions. We then proceeded to the SLR station, where they also conduct observations of the Moon (LLR). The control center is also responsible for managing the SLR station. The Wettzell campus is also home to the other two space-geodetic techniques, with several GNSS

receivers and a DORIS beacon. Additionally, the campus features a unique instrument known as the Ring Laser ‘G’, which can measure the Earth’s rotation instantaneously. For geodesists, the Wettzell campus is a true paradise. The educational tour came to an end after a few hours, and the attendees went their separate ways back to town.



Thomas Klügel (right) introducing the VGOS twins during the Wettzell Observatory tour.

In addition to the EVGA meeting, the IVS Analysis Workshop took place on the fourth day, chaired by John Gipson. The workshop aimed to address the challenges faced by several analysis groups. Karine Le Bail took over the lead of the VLBI Scale Working Group, succeeding John Gipson. The workshop wrapped up before lunch, and some attendees were already on their journey home.

Planning an event comes with its own set of challenges and uncertainties. But the local organizers managed to pull off a commendable job in organizing and making it a successful event.

As of now, the location for the upcoming EVGA meeting in 2025 has not been finalized. So, until then: *Auf Wiedersehen!*



Guided tour of Bad Kötzing at the Pflingstreiterbrunnen (Pentecostal Rider Fountain).

Report on 24th IVS Analysis Workshop

John Gipson
IVS Analysis Coordinator

The last in-person IVS Analysis Workshop was in Gran Canaria in March 2019—over four years ago. Since then, all workshops have been virtual. In general, there have been two workshops each year. The spring/summer workshop has been tagged to some virtual IVS meeting, while the fall/winter one has been free-standing. Although these meetings were necessary and fruitful, it was good to at last meet face-to-face after four years.

Roughly 50 people attended the workshop. In past Analysis Workshops, 90+ percent of the attendees were analysts. This time around I would estimate that about 20% of the attendees were not analysts but were from the correlators and from stations. I first noticed many non-analysts attending the virtual workshops held during the COVID pandemic. In large part this was because it was easy to attend these meetings. In any case, this is a welcome change because it is good to get the opinions of everyone involved in producing the data. This is one of the few positive effects of COVID!

I organized and chaired the meeting. Rüdiger Haas graciously agreed to take notes. The meeting lasted four hours, which allowed us to cover the 14 (!!) items on the agenda before breaking for lunch and a well-deserved Bavarian “dunkelweizen” beer. I don’t want to repeat everything that was discussed, but I do want to mention a few items which I think are of general interest.

ITRF2020. The IVS officially transitioned to ITRF2020 on March 31, 2023. The analysis changes

made included using the new 2020 post-seismic deformation (PSD) models and new gravitational deformation models that have become available. All the IVS Analysis Centers (ACs) successfully made the transition, and the Combination Center

has been submitting EOP products in the new frame. Many ACs submitted SINEX files for all ~7,000 sessions, but a few did not. I will not point any fingers, but if you are one of the laggards, please submit these!

On a related matter, the IERS would like to do updates to ITRF2020 on an annual basis. To facilitate this, all the ACs are requested to submit SINEX files for the period 2021–2023.5 by October 1, 2023. The remaining files for 2023 should be submitted by January 31, 2024. The IVS Combination Center will then submit their results to the IERS by March 1, 2024. The SINEX files should include additional information so that the IERS can remove loading effects, that is, the format should be the same as for ITRF2020. Many ACs do this routinely, so they will not need to do anything different. A few ACs do not routinely include this information and will need to reprocess their data.

We recognize that there will be an inconsistency in the data between the data that was originally submitted for ITRF2020, and the data from 2021–2023 since some of the models are different (e.g., PSD, gravitational deformation). Ideally, all sessions would be reprocessed with a consistent set of models. However, there is not sufficient time to reprocess this time around. The expectation is that starting with the 2024 submission for the ITRF, all



IVS Analysis Coordinator John Gipson.

ACs will reprocess all data on an annual basis using the best available models.

Scheduling and Better Feedback. There was a long discussion on how to improve scheduling. The consensus was that all IVS sessions should be scheduled with calibrator sources. For Intensive sessions, it may be sufficient to have two calibrator scans, one near the beginning and one near the end. 24-hour sessions should have several calibrator scans, say roughly every 4–6 hours. The calibrators should be chosen so that the SNR is strong (~100) on all baselines. Ideally the calibrator should be observed by all stations, but this is impossible for global networks. In this case, enough calibrators should be observed so that all the stations can see them, and the subnets can be linked together. For example, one calibrator might be visible by 2/3 of the stations, another by 2/3 of the stations, and together all stations are covered.

Another issue is the long time between when a session is scheduled and when it is correlated. Frequently problems are encountered during correlation, which can be fixed at the stations. The latency of the VGOS operational sessions is currently one month, while the cadence of the sessions is planned to increase to weekly in the fall of 2023. This means that prior to a problem being uncovered you are running a new session. To prevent this, the proposal is to send one or scans (probably calibrator scan) to the correlator immediately after a session is done. This scan will be correlated to see if there are any problems, and if so, the stations will be notified so the problem can be fixed. This approach should have minimal disruption to operations. Another option would be to do dedicated fringe tests prior to each session, but this was abandoned because of the extra work involved.

Ad hoc Working Groups. There are several new and revitalized ad hoc Working Groups. These are NOT formal Working Groups that require a charter from the IVS Directing Board. These are rather a group of organized people who see a problem and want to solve it. *Anastasiia Walenta* volunteered to organize regular meetings between members IVS

ACs to share knowledge and establish some standard for best-practice. *Lucia McCallum* is chairing a group to establish PIs for all of the IVS sessions. The PIs will be responsible for all aspects of the session: scheduling, correlation, and analysis. The PIs will provide regular reports on performance. Many IVS sessions already have a de-facto PI, but this formalizes it. *Karine Le Bail* is going to take over leadership of the Working Group on VLBI scale. The goal of this is to study the apparent scale drift of VLBI w.r.t. the ITRF2020, which occurs sometime after ~2013 to determine (i) if this drift is real and (ii) to identify the source. The success of any group depends both on the leaders and participants, and I wish everyone involved success.

Cleanup. There were various ‘cleanup’ items mentioned. For example: (1) There is some inconsistency in the labeling of precession and nutation blocks in SINEX files. (2) It is unclear what time scale is used by different ACs—UTCI, TAI, TDB, etc. (3) Most of the IVS ACs have transitioned to the EOP v3 format, but not all have. (4) There are some problems with the ‘number of observations’ in the SINEX block. The various ACs need to work to remove these problems.

Next Meeting. I will schedule a virtual IVS Analysis Workshop during the fall of 2023. The next in-person workshop will be in Tsukuba. I look forward to seeing you there, and I will treat all the attendees to sake at the end!



IVS Analysis Workshop in session.

The IVS Newsletter is published three times annually, in April, August, and December. Contributed articles, pictures, cartoons, and feedback are welcome at any time.

Please send contributions to the General Editors; the deadline is one month before the publication date. The editors reserve the right to edit contributions.

General Editors Dirk Behrend (Dirk.Behrend@nasa.gov), Kyla Armstrong (Kyla.L.Armstrong@nasa.gov)

Feature Editor Hayo Hase (hayo.hase@bkg.bund.de)

Layout Editor Heidi Johnson (heidij@mit.edu)

Current and past newsletter issues are available at: <https://ivscc.gsfc.nasa.gov/publications/newsletter/>.

IVS Coordinating Center NASA GSFC, Code 61A.1 Greenbelt, MD 20771
<https://ivscc.gsfc.nasa.gov> | ivscc@lists.nasa.gov | phone: 301-614-5939

