IVS NEWSLETTER
ISSUE 61, DECEMBER 2021

From the Editors

The IVS Newsletter is sporting a brand-new design as of this issue. The new look was designed to modernize and simplify the newsletter's appearance, to match the new logo, and to be easy to read (and typeset). A list of articles is now provided on the front page of each issue. The content and cadence of issues will not be changing. As always, the newsletter archives are online at https://ivscc.gsfc.nasa.gov/publications/newsletter/, and contribution suggestions may be sent to Dirk Behrend (Dirk.Behrend@nasa.gov) and Kyla Armstrong (Kyla.L.Armstrong@nasa.gov).

News from around the IVS

Dirk Behrend
NVI, Inc./NASA GSFC

The IVS Directing Board met for a virtual meeting on September 30, 2021. Among other things, the Board approved a proposal from Wettzell to become an official IVS correlator. The International Astronomical Union (IAU) adopted Resolution B1-2021 "in support of the protection of geodetic radio astronomy against radio frequency interference" on September 12, 2021. A draft resolution for the IUGG General Assembly 2023 is underway. For creating an ITU-R (International Telecommunications Union, Radiocommunication Section) reference document, a Question on Geodetic VLBI was submitted to and accepted by ITU-R Study Group 7 (Science Services) on September 7, 2021.

The VTC subgroup on source structure presented a report with recommendations on VGOS scheduling (more even distribution of observations, three or more stations per scan). An expanded version of the report is planned to be published in a peer-reviewed journal.

Inside this issue

The 4th VLBI Training School will be changed to an online event only. To accommodate more time zones, the school will now run for four days with less hours per day. The new dates are March 22–25, 2022. The 12th IVS General Meeting (and related splinter meetings), on the other hand, will be held as a hybrid event on the originally advertised dates according to Helsinki time.

University of Alicante VLBI Analysis Center (UAVAC)

View of Alicante from the Castillo de Santa Bárbara. The front page shows the harbor with the castillo in the back.

In June 2018, the University of Alicante became an IVS Associate Analysis Center. In addition to the establishment of the RAEGE network in Spain and Portugal, the creation of analysis capabilities at the university level was a logical step to assure the use of VLBI data in Spain. Despite being a young group, the lead of UAVAC, José Ferrándiz, has been working in the field of Earth rotation for quite some time. Newsletter editor Hayo Hase checked in with José via email to learn more about the activities and plans.

José, how did you enter the VLBI world?

My first contact with VLBI happened in the late 1970s, when I started my postdoc on lunar librations. At that time, VLBI competed with lunar laser ranging (LLR) for the accurate determination of the Moon's rotation. The reports I got showed that the VLBI emerging technique not only allowed an astonishing accuracy in the determination of transcontinental baselines, but it was also useful to estimate other parameters (e.g., polar motion, Universal Time). However, I could not get involved in VLBI activities then and that "summer love" came to an end.

José Ferrándiz in his office.

Things began to change after 1983 at Valladolid University, in particular when I became the head of the Department of Engineering Maths, with Earth rotation slowly becoming a priority task. In 2012, I was entrusted with organizing and chairing an IAU/IAG Joint Working Group on Theory of Earth Rotation. It posed a hard challenge, because VLBI observations are clearly more accurate than theory; therefore, understanding VLBI well is a key to advancing theories and models.

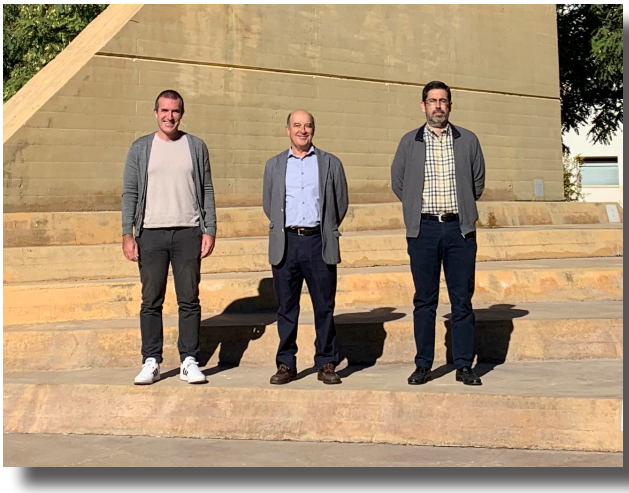
How did you end up at the University of Alicante and what are your duties there?

That is easy to understand—if you know the city. I was born in Alicante, a nice place to live on the Mediterranean Sea, with a mild and sunny climate, good communications, long history, and an open spirit. The University of Alicante (UA) was young and innovative, and I had a chance to move there in 1993 when it started the establishment of degrees in engineering. The UA does not have degrees in astronomy nor geodesy; however, I soon started teaching advanced topics at the postgraduate level, including space dynamics and space geodesy. We do not have enough students

to offer VLBI courses, but specific topics like Earth rotation and altimetry are covered in a learning-through-projects approach, which has worked well so far and resulted in a small but effective research group.

What was the motivation to become an Associate Analysis Center?

Obviously, Earth rotation theory and observations should share a common basis and advance in lockstep. However, there are some inconsistencies that are difficult to remove; for instance, EOP determination involves coordinates in specific reference frames, whereas the current nutation model was developed for ideal reference systems which were never realized. The improvement of models cannot ignore how VLBI works, but the VLBI world is complex—discussions with experts improve the chances of success. Entering the community of IVS ACs is an excellent way to learn and share insight. Finally, the commitment of running an IVS AC is a way of having myself closely tied to the actual Earth rotation and share that pleasant feeling with my colleagues.



The UAVAC group (from left): Santiago Belda, José Ferrándiz, and Alberto Escapa.

Which VLBI software packages are you working with and why?

We work with the GFZ version of VieVS and we intend to move to PORT soon after upgrading our computers. Our primary technical contact, Santiago Belda, started his training in Vienna under the guidance of Johannes Böhm, and then changed to GFZ being supervised by Harald Schuh and Robert Heinkelmann. Using PORT is very convenient for our cooperation with GFZ and as it has been developed in recent years, the people that wrote many routines are still available to answer questions or help the development of routines to test and validate new models.

Which specific subjects are you analyzing with the VLBI data?

The main outcomes of our analyses in the last years include: the development of improved FCN (free core nutation) models and corrections to the precession-nutation models IAU2000/2006 to bring the unexplained variance below 100 µas for each CPO; consistency issues among conventional EOP and reference frames; and a new method for CPO prediction that provides an improvement of about 35–40% relative to the IERS procedure.

In 2019–2020, our analysis activity was slowed down due to funding difficulties whose solution took longer than expected in part due to the pandemic. The theoretical work done by Alberto Escapa, current Vice-President of the IAU Commission A2, and Tomás Baenas was unaffected; they contributed analytical corrections that we intend to test with VLBI data in the near future.

Looking forward, what are your main research and analysis plans?

Our funding problems are solved after the recent approval of several research proposals giving us medium-term stability. I appreciate very much the support of our regional government by funding a center-of-excellence project called PROMETEO and by providing a GenT grant (for excellent young researchers) to Santiago. We also have a national project including cooperation with GFZ and the Spanish IGN. In the framework of these projects, we are going on with the efforts to improve the CPO models and validate our results by performing thorough tests with VLBI data. Santiago, several students, and I participate in the IERS Second EOP Prediction Comparison Campaign. Our task will extend to the whole EOP set and includes helping the development of new methods.

In Spain, VLBI operation is done mainly by the IGN. How large is the VLBI community in Spain and do you have regular contact?

The Spanish radio astronomy community is quite large and developed. We have several as-

trophysical institutes and observatories with good equipment and many days of clear skies. In contrast, the geodetic VLBI community is rather small regarding the number of people—but not as for its aspirations. As far as I know, the UAVAC hosts the only geodesy group outside of the IGN. For many years the IGN has been in charge of the geodetic VLBI activities in Spain. It operates the Yebes station and promoted the development of the RAEGE network, including the technological aspects as an IVS Technology Development Center. The IGN's involvement in VLBI data analysis has not been big—although there are plans to increase the efforts. According to its mission, the IGN must provide a fully reliable public service, and this perspective favors the interaction with us as a university group that highlights the research facets.

The RAEGE project is on its way to completion. Once finished, the Spanish-Portuguese cooperation will provide VGOS data. Do you see an opportunity for your Associate Analysis Center in this?

Today the Yebes Observatory has the only fully VGOS-compliant RAEGE station. But in some months Santa María will be upgraded by changing the current S/X receiver to a broadband VGOS receiver. The establishment of the Flores and Gran Canaria stations is further afield; therefore, we are quite curious about how much the first two RAEGE stations can already contribute to the global VGOS network. Our projects jointly with the IGN include making independent evaluations of the initial RAEGE behavior and checking results with the IGN ones (mostly obtained using WHERE), as well as simulations of the potential whole network performance.

José visiting the Zhangye Danxi National Geological Park in China.

As for me, I am particularly interested in knowing which EOP could be determined from VLBI at a daily or sub-daily rate and how accurately. I think VGOS can enlighten us on issues as elusive as improving the conceptual separation of nutation and polar motion or the understanding of the differences among solutions of the latter obtained from different techniques.

What are your interests besides VLBI?

I am a curious person and have many interests in science as well as outside of it. My likes are quite varied ranging from history to wildlife to music and opera to meeting friends for a good meal or drink. I also enjoy the countryside and going for a walk for a few hours while enjoying the landscape.

Thank you very much for the interview.

Meetings

VLBI Training School
Virtual Meeting
March 22-25, 2022

Twelfth IVS General Meeting
Helsinki, Finland
March 27–April 1, 2022

EGU General Assembly 2022
Vienna, Austria
April 3-8, 2022

AOGS 19th Annual Meeting
Honolulu, HI, USA
June 5-10, 2022

IAU XXXI General Assembly
Busan, Republic of Korea
August 2-11, 2022

REFAG 2022
Thessaloniki, Greece
October 17-20, 2022

Unified Analysis Workshop 2022
Thessaloniki, Greece
October 21-23, 2022

GGOS Days 2022
Munich, Germany
November 7-25, 2022

AGU Fall Meeting
Chicago, IL, USA
December 12-16, 2022

Remembering Tom Clark

Jan McGarry and John Degnan
NASA GSFC

Space Geodesy lost a longtime colleague and friend with the passing of Thomas Arvid Clark on September 28, 2021. Tom was a pioneer in Space Geodesy and Very Long Baseline Interferometry (VLBI), and a founding member of the NASA Crustal Dynamics Project.

Tom received his B.S. in Engineering Physics and his Ph.D. in Astro-Geophysics from the University of Colorado in 1961 and 1967 respectively. From 1966 to 1968, he served as Chief of the Astronomy Branch at NASA Marshall Space Flight Center and as Project Scientist on the Spacelab Coronagraph. At GSFC, where he moved in 1968, Tom received numerous NASA awards for his pioneering work on Radio Astronomy Explorer 1 and 2 and several generations of Very Long Baseline Interferometry systems. Tom developed the Totally Accurate Clock (TAC), an inexpensive GPS timing receiver that found widespread use in a number of global networks. Tom was named a Fellow of the American Geophysical Union (AGU) in 1991 and a Fellow of the International Association of Geodesy (IAG) in 1999. Tom was also a pioneer in amateur and digital radio; he designed and flew several low-cost satellites for relaying amateur radio messages around the globe and is a past president of AMSAT. He was one of only 50 initial inductees into the CQ Amateur Radio Hall of Fame, a list which included such engineering luminaries and inventors as Guglielmo Marconi (radio), Samuel Morse (telegraph), Nikola Tesla (HF generators and radio), and John Bardeen and William Schockley (transistor). Tom retired from GSFC in 2001 but remained active in Amateur Radio activities.

Tom Clark (right) receiving the gold medal for his lifetime contributions to VLBI from the late director of IAA Andrey Finkelstein in 2005.

Those of us who worked with Tom during the Crustal Dynamics period remember him as a brilliant mind, a very interesting and sometimes caustic character, but someone who was kind, supportive, and very helpful to those of us around him. We will miss him.

Tom giving a presentation at the IVS 10th Anniversary Celebration in Bordeaux in 2009.

Memories

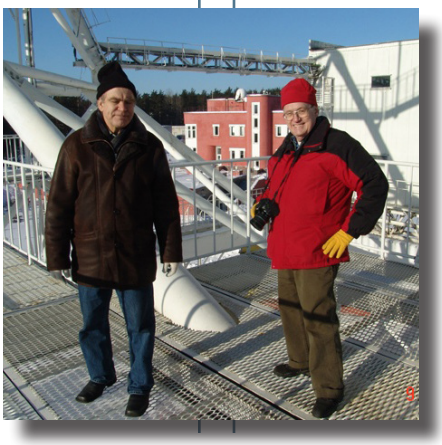
Nancy Vandenberg

When I graduated with my PhD, which was on VLBI observations of the pulsar in the Crab Nebula, Tom wanted to give me a stuffed crab as a memento. He couldn't find one, so he got me a stuffed lobster instead. He marked up its nautical cap with "NP 0532" and attached a note to its claws saying, "Would you believe The Lobster Nebula?" To me that always showed Tom's ultra-creative outlook—if something isn't available that you need, re-make reality to make it work in another way. I still have that lobster on my desk today.

Memories

Rick Hambly

During the AMSAT years, Tom and I would make the long drive from Maryland to Dayton Ohio together. His wonderful wife, Elizabeth, would meet me at the door to ask me to be sure Tom ate his green vegetables, which was not his favorite food. As we headed out, I would often pick a subject for the trip to keep us engaged. One year I would ask him about Maxwell's equations, another year it would be Schrodinger's uncertainty principal, and another would be quantum mechanics. These discussions would last for hours. Tom loved teaching and I was a willing student. I learned more during these drives than I did from almost any other source. When teaching, Tom was animated and happy. He injected humor in these sessions and in all his presentation, whether professional or to ham radio groups.



Tom (right) during a visit of Svetloe Observatory together with Alexander Ipatov in 2005.

Memories

Axel Nothnagel

I got to know Tom as a very decisive and pragmatic person. In August 1985, I passed by the Washington D.C. area to establish contact with Bill Carter (NGS) to figure out possibilities for getting a Mark III terminal on loan to HartRAO, South Africa. When I sat in Bill's office, he contacted Tom who quickly proposed a personal meeting on the same day at some address between GSFC and NGS. When Bill and I arrived there about an hour later, we stood in front of a very obscure shack which turned out to be a burger shop with no windows. Sitting in there, Tom sketched out the plans for a joint NGS-GSFC-HartRAO project with the Kwajalein receiver box and a vacant Mark III terminal to be sent on a two-month loan to HartRAO only three months later. And so Tom helped to lay the foundation stone of the first geodetic and astrometric Mark III observations in the southern hemisphere in January and February 1986 resulting in a multi-year series called IRIS-S.

Memories

James Campbell

I first saw Tom at the famous Heidelberg VLBI meeting in 1978 and was immediately impressed by his appearance—brimming with energy, overflowing with new ideas and insights. With undisguised pride he presented the new MKIII system as the most accurate space technique ever devised. This system was sure to become the key to 'real-time' measurement of plate tectonics. In his words the challenge was to detect the rate at which fingernails grow over distances of thousands of miles... In subsequent years Tom was pivotal in combining efforts by international VLBI groups in setting up the global geodetic VLBI network. I am grateful having met and worked with a unique personality like Tom Clark.

Tom at the 1978 Heidelberg VLBI meeting.

Perché non costruisci un radiotelescopio?

40 Years of Radio Astronomy in Bologna

Franco Mantovani
IRA/INAF Bologna

Aerial photo of the Radio Astronomical Observatory of Medicina (Bologna) with the Northern Cross in the foreground and the 32-m diameter VLBI antenna in the background. The Northern Cross is a transit instrument working at a wavelength of 73.5 cm (or 408 MHz).

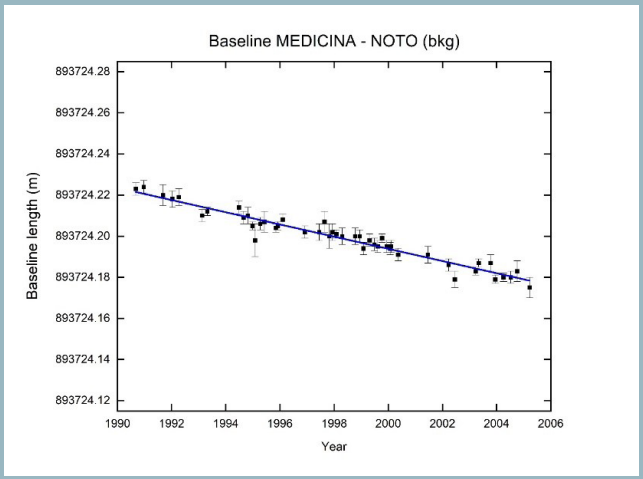
Recently, a group of researchers from the Italian Institute of Radio Astronomy (IRA) completed a book on the history of the institute from its origins until the year 2000. That is, the book covers the first 40 years of the IRA's activities.

The birth of radio astronomy in Italy took place in the university environment. '"Why don't you build a radio telescope?" Professor Giampietro Puppi tells me one day on the stairs of the Institute.' With these words, Marcello Ceccarelli, the father of Italian radio astronomy, recalls the beginning of this adventure in his book 'Viaggio Provvisorio' (1976) in his usual joking style. Professor Puppi was the director of the Institute of Physics. This meet was presumably held in May 1959 and it is likely that, indeed, Puppi first approached Ceccarelli this way.

The original university group gradually expanded to meet growing needs for the management of the infrastructure and new areas of scientific research. In 1970, there was a major institutional transition when the CNR established the Radio Astronomy Laboratory as a center for the development of Italian radio astronomy, which was then entrusted with the management of the 'Northern Cross' radio telescope, inaugurated on 24 October 1964.

From the very beginning, the mix of scientific and technological research has been the engine of the development for radio astronomy in Bologna. The Northern Cross was not conceived as an 'observatory' functional to scientific activity but as a real experiment in cosmology. This targeted approach was also the basis for the construction of the Medicina and Noto VLBI antennas.

This story stops in 2000 but obviously the history of the Radio Astronomy Institute continues. Over the years, the members of the IRA have expanded their research fields, international collaborations, and their presence in international institutions, and they have become the reference experts in the design of future radio astronomical instrumentation. This adventure that began in Medicina in the lower Po valley in the early 1960s continues successfully. The book can be downloaded for free from *https://info.ira.inaf.it/en/about/ira-history-book/* in both English and Italian.



Baseline length variation rate between the Medicina and Noto antennas obtained from VLBI data. The data up to 2005 confirm the 1999 result obtained by Tomasi, Rioja and Sarti (1999): the distance between Medicina and Noto is shortening with a speed of 3.1 ± 0.3 mm / year.

IAU Resolution B1-2021 on Geodetic VLBI

Hayo Hase
BKG

On September 12, 2021, the International Astronomical Union (IAU) adopted Resolution B1-2021 "in support of the protection of geodetic radio astronomy against radio frequency interference." As geodetic VLBI observes cosmic radiation, it is categorized as a Radio Astronomy Service (RAS). However, the allocated bands to RAS in the range of 2–14 GHz are mostly narrow and useful for spectral line observations only. Geodetic VLBI needs broader bands to increase its resolution and accuracy. According to the ITU-R Radio Regulation, geodetic VLBI as a passive (receive only) service may be tolerated using frequencies allocated to other services if it does not interfere with them; however, the inversion does not apply.

The increasing allocation and use of the microwave spectrum to telecommunication services raises concerns among the IAU members; upcoming mega-satellite constellations like Starlink and OneWeb threaten the quiet and dark sky requirements in astronomy. In addition, new mobile communication bands for 5G and later 6G will further exploit the electro-magnetic spectrum using ground-based active transmitters for the corresponding mobile devices in all parts of the world and, hence, limit the radio quiet spectrum for VLBI.

Among other points, the resolution resolves...

"23. to express the view that the most effective protection of geodetic radio astronomy sites would be through radio quiet or coordination zones,

24. to encourage studies by the VLBI community possibly together with national spectrum authorities on the impact of the increasing radio frequency interference to geodetic radio astronomy observations, to support site testing and maintenance to avoid generating interference or importing interfering devices, and to support monitoring the ambient spectrum and tracking the occurrence of interference [23], 25. to encourage astronomers, geodesists and scientists of related disciplines, to work proactively in protecting radio astronomy service observations in the frequency range 2–14 GHz and to join the efforts of the European Committee on Radio Astronomy Frequencies (CRAF) and elsewhere, ..."

The full five pages of the resolution can be accessed at *http://www.iau.org/static/archives/announcements/pdf/ann21040a.pdf.*

This IAU resolution is one element in the strategy of raising awareness of the needs of existing and new geodetic VLBI observatories. The VGOS broadband receivers will register any transmission in the range of 2–14 GHz and, therefore, need radio-quiet conditions at the observatory sites. The saturation of the amplifier by one strong interferer is deleterious to the entire VLBI observation. This fact is especially important for the site selection of new observatories. While protection against ground transmitters may be coordinated by national spectrum authorities (on a case-by-case basis), the protection against artificial transmitters from space can only be provided by the allocation process through the World Radio Conferences or by direct negotiations with the operators of such systems. The registration of a VLBI network station as radio astronomy service site by the National Spectrum Authorities at ITU-R is an important step to be considered later by any upcoming spectrum users.

The IVS members are requested by the IAU-GA Resolution B1-2021 to do studies on the impact of the changing electro-magnetic environment in order to provide necessary input information to the European Committee on Radio Astronomy Frequencies (CRAF) and to the National Spectrum Authorities, which are currently drafting an ITU-R Report on Geodetic VLBI. Such a document shall provide spectrum managers with the necessary information on the technical and operational characteristics of geodetic VLBI and how it uses the radio spectrum to achieve the accuracy needed to fulfill its mission; and from this will emerge the need for protection. Currently tests are underway to determine which VGOS observation bands are the most suitable.

2021 Fall Virtual Analysis Workshop

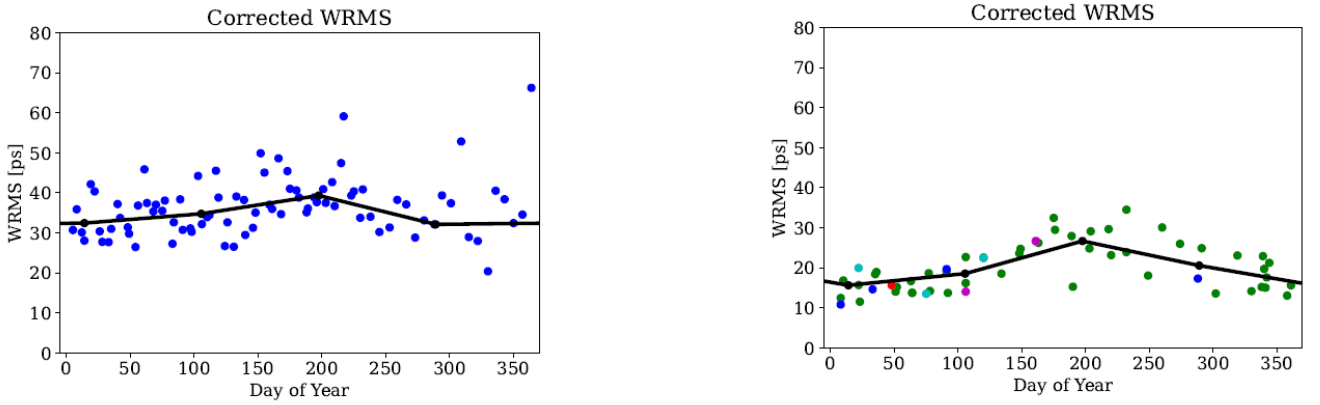
John Gipson
NVI, Inc./NASA GSFC

The second Virtual IVS Analysis Workshop was held on September 13, 2021 via Zoom. Roughly 75 people attended the meeting, and it ran for three hours instead of the originally scheduled two. The first part of the meeting started off with a series of informational presentations, mostly of a programmatic nature:

- The three IVS Data Centers are moving towards using a common ingest procedure. One consequence of this is a stricter criterion for accepting files.
- Dirk Behrend discussed the VGOS observing plan for 2022, which has a 24-hour VGOS session per week, with many VGOS Intensives every weekday.
- Hendrik Helmers talked about the VLBI submission to ITRF2020.
- John Gipson discussed the need to have PIs for each type of IVS session. The PIs (which could be one or more institutions) would be responsible for all aspects of the session, including the design and success criteria, and would produce an annual report on the sessions.
- Claudia Flohrer discussed a proposed update to the EOP file format which would include a mandatory header block with information about what models were used, etc. This update was discussed and approved at the spring Analysis Workshop. Claudia has been revising her proposal. The current plan is to transition to the new format in early 2022.
- Chris Dieck discussed a change in the session-naming convention which is more flexible and allows for many sessions on a single day. This would not be implemented until 2023, giving ample time for discussion.

The remainder of the session focused on current results and how to improve them:

- Leonid Petrov advertised the availability of Level1 data (correlator output) and demonstrated that you could increase the number of points used in analysis by careful fringe fitting.
- Some people had expressed concern that the VGOS sessions were not doing as well as expected. James Anderson showed that the noise of the sessions exhibited a seasonal dependence. This is something that we could only see now once we had a few years of regular VGOS observing. This seasonal dependence is similar to what we see in S/X observing, where it has been attributed to mis-modeling the atmosphere.
- There was a long discussion on how much effort the correlators should expand trying to salvage bad data. The issue is that there are sometimes problems at a station that cause problems in correlating the data. Sometimes this can be fixed with enough effort, but this will delay the release of the data. It also means that the correlators have to spend extra time fixing this, and correlator time is scarce. The consensus was that if it took more than an additional day of people time, the data should be thrown away. This does not preclude the correlators providing feedback so that the stations can fix problems.



Seasonal variation seen in the session noise using the S/X system (R1 sessions 2020–2021, left) and the VGOS system (sessions 2017–2021, right). Credit: James Anderson.

- Axel Nothnagel, who was the first IVS Analysis Coordinator and subsequently the most recent IVS Chair, suggested that all IVS Analysis packages should model EOP as piece-wise-linear functions and provide the estimate of the offsets. This would allow for easier combination of the IVS EOP data products.
- There was also an extended discussion of how to tie the S/X and VGOS networks together. In 2020 there were three mixed-mode sessions involving large networks which were roughly split between VGOS and S/X stations. This involved a lot of effort in correlation. Since many VGOS stations are co-located with S/X stations, the local tie can be done using VLBI observations involving the S/X and VGOS antennas. Going forward, the mixed-mode sessions should be devoted to tying in VGOS stations such as Fort Davis which are not co-located with an S/X station and should use a smaller network which would be easier to correlate.

Additional topics on the agenda had to be excluded because of time limitations. All in all, the workshop was very successful, and for the near future we will continue to hold these roughly every six months.

VLBI Station Veteran Retires after 45 Years

Chris Coughlin
Peraton, Kokee Park

Time is the one thing that never stops for anything or anyone. Time has flown by for the past 45 years for one of KPGO's dearest and most accomplished team members. Kelly Kim, previous station manager and long-time KPGO technician, has decided to announce his retirement effective September 2021.

Kelly started working at the Kokee Park NASA STDN Tracking Station in July of 1976 supporting the Apollo Shuttle Missions in the Unified S-Band Building which is now the Kokee Park Geophysical Observatory Operations Building. In 1989, the Hawaii Tracking Station was no longer needed to support human space flight with the development of the Tracking and Data Relay Satellite System. At that time the site was repurposed to support the NASA Goddard Crustal Dynamics Project and the US Naval Observatory and was renamed to the Kokee Park Geophysical Observatory.

Kelly Kim retires after 45 years!

Kelly held his position at the site during the transition and merged into a new role supporting VLBI in Hawaii. In 1992, Kelly supported the installation of the S/X 20-m radio telescope and helped in developing the local operating procedures that we still use today in support of VLBI operations and maintenance. The due diligence and technical expertise of KPGO staff members like Kelly is the reason the legacy S/X 20-m system is still alive and well, producing many VLBI data sets for the network.

When I came onboard the KPGO team in 2007, I was lucky enough to have Kelly as my station manager and more importantly my mentor, which has led me to where I am today. I would like to congratulate Kelly on his long illustrious career at KPGO, and also on his well-deserved retirement! Kelly is looking forward to spending more time with his family and wishes the VLBI community many more years of success. Mahalo!

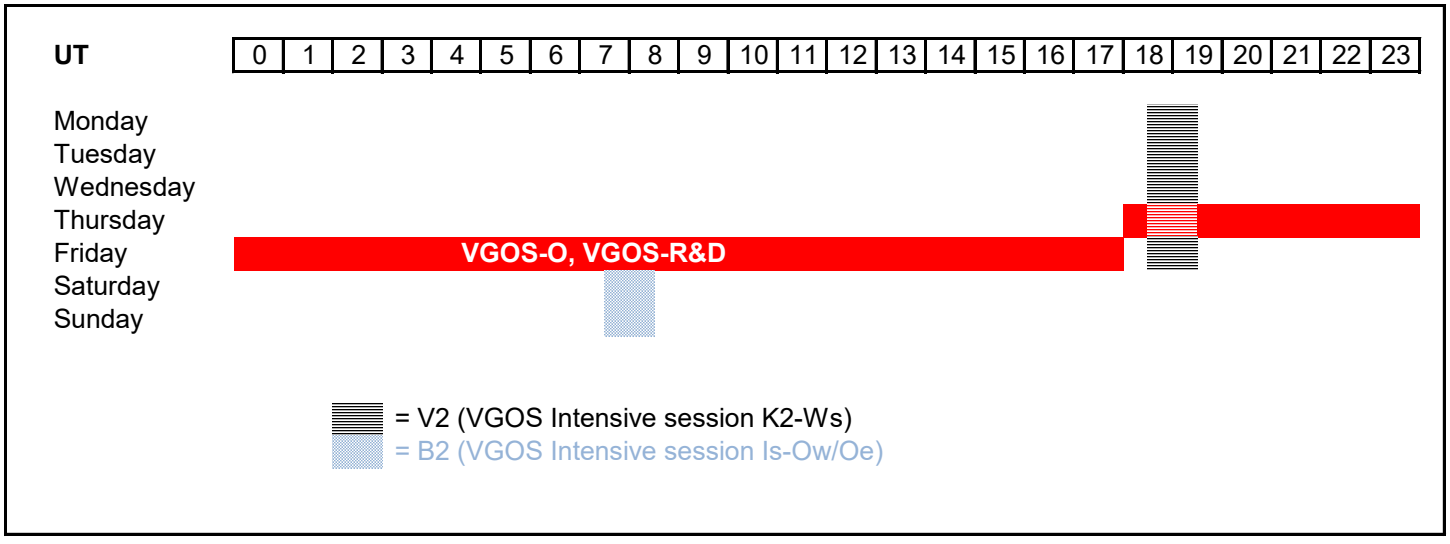
VGOS Observing in 2022

Dirk Behrend
NVI, Inc./NASA GSFC

The infrastructure implementation efforts of the VLBI Global Observing System (VGOS) have been gradually progressing over the last few years. In 2021, the VGOS observing network has grown to approximately nine stations and in 2022 it is anticipated that five or six more stations will be added to the fledgling network following the process of proving their operational stability. With southern hemisphere stations being absent in the global VGOS sessions thus far, we especially look forward to having (part of) the AuScope array as well as Hartebeesthoek joining the fray. While modernized station infrastructure is a very important piece of the VGOS (which shall eventually sport a network of 25+ stations), other infrastructure components of the VLBI processing chain need to be further developed as well, including the VGOS correlation/post-processing capabilities and VGOS data analysis.

In 2021, five correlators processed operational VGOS sessions consisting of VGOS Operational (VO), VGOS Intensive (V2), VGOS Test (VT), and VGOS R&D (VR) sessions. With several of the VGOS correlators still learning their trade (and with the legacy S/X program competing for their resources), an increase in the VGOS session cadence had to be eased in. For instance, the VO sessions remained at a two-week rhythm for the full year and the V2 sessions were gradually increased from two sessions per week to the five weekly sessions during workdays by November. At the end of the year, a sixth correlator became available to process Intensive-type observing. In concert with the increase in correlator time, it is needed to also ramp up data transport and storage capabilities.

In 2022, it is planned to basically go to weekly VO sessions and to continue the five-day-per-week V2 observing. In addition, other Intensive baselines (e.g., Mg-Ws, Is-Ow/Oe) will complement the observing plan. A subset of the VO sessions will be rededicated to VGOS R&D efforts. There will be six VR together with six VT sessions organized to demonstrate operational readiness of "high rate observing." The session pairs will be run every other month with increasingly aggressive strategies (e.g., lower scan lengths in steps down to 3–8 s, reduced AP times at the correlator from 1 s to 0.25 s). Also, an improved frequency sequence (RAS matching) will be employed (already tested in VT1288). The pairing of the VR/VT may require the prioritization of the processing order and correlation time frame.



Weekly layout for VGOS observing sessions in 2022.

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.

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