

IVS NEWSLETTER

ISSUE 63, August 2022



Mid-Year Highlights

Once again, the IVS is gearing up for a busy election season. Seven positions need to be refilled on the Board. Stations came out of their hibernation and performed maintenance work that was previously on hold due to Covid. It may also be a good time to do some seasonal house cleaning chores—mind those filters. Lastly, preparations are underway to modify the vgosDB naming convention and the IVS Master File format. If all goes according to plan, we will see the new conventions taking effect with the observing plan for the next calendar year.



Board Elections on the Horizon

Dirk Behrend
NVI, Inc./NASA GSFC

In the fourth quarter of this year, the IVS will hold elections to fill seven positions on the Board for the next governing period starting in February 2023. The assignments comprise four Representative and three At-Large positions. The positions in the Representative category to be renewed for the next four years are: one of two Network Representatives (currently held by Hayo Hase), the Correlator Representative (David Hall), one of two Analysis Center Representatives (Anastasiia Girdiuk), and the Technology Development Representative (Chet Ruszczyk). In addition to these, the three At-Large positions (Alet de Witt, Yu Takagi, and Nadia Shuygina) are to be elected for a two-year term. Except for Alet, all incumbents are eligible for re-election.

Please consider current or new nominees for the seven positions. Take into account, though, that any nominee **MUST** be an IVS Associate Member. So, be sure that the Associate Member list for your institution is up-to-date and contact the Coordinating Center if an update to the list is needed. The current composition of the Board,

Inside this issue

Mid-Year Highlights	1
Board Elections on the Horizon	1
McDonald Geodetic Observatory (MGO)	2
Filters Everywhere	6
Critical Role of Geodetic Infrastructure Highlighted at UN-GGIM	6
GGAO Successfully Replaces Jackscrew of 12-m Antenna	7
Updating the vgosDB Naming Convention	9

including term information, and the Associate Member list are available on the IVS website.

The current Board will name an Election Committee that will prepare and distribute a call for nominations, likely in the September/October 2022 time frame. The call will also contain more detailed information about the election procedure. The IVS community should begin preparing to nominate their favorite candidates and take part in the decision process. This is your chance to influence the policies of the IVS.

McDonald Geodetic Observatory (MGO)

The McDonald Geodetic Observatory (MGO) has been observing in IVS VGOS sessions since early 2020. The station is located near the town of Fort Davis, Texas and is not far from the Fort Davis VLBA station (less than 10 km). Newsletter editor Hayo Hase interviewed Eusebio “Chevo” Terrazas from the Texas group as well as Jeffrey “Jeff” Dorman from the NASA Space Geodesy Project team at GSFC to get some insights into the activities of this newer VGOS station and its history. Find below an excerpt of the interchange, slightly edited for clarity.



Chevo Terrazas, on-site manager of MGO.

Chevo, can you say a few words about yourself?

Hello, my name is Eusebio Terrazas, but everyone knows me as Chevo. I am the on-site manager for the McDonald Geodetic Observatory (MGO) located in the Davis Mountains north of Fort Davis, Texas. I oversee operations on a day-to-day basis for our VLBI and SGSLR sites as well as assist when needed on our other projects such as GNSS.

What interest does the University of Texas at Austin (UT Austin) have to host MGO on its property?

MGO is a joint venture between the UT Austin’s Center for Space Research (CSR), UT Austin’s College of Natural Sciences’ McDonald Observatory, and NASA’s Space Geodesy Project (SGP). McDonald Observatory is an astronomical research location and studies all forms of different astronomical objects and sciences. With the addition of the McDonald Geodetic Observatory, it has become a complete observatory being able to study not just astronomical objects but also geodetic changes as well.

Can you give us a few historical tidbits about the observatory?

The University of Texas has had a long-standing relationship with NASA dating back to the 1970s when lunar ranging was accomplished using the McDonald Observatory’s 2.7-m Harlan J. Smith Telescope. After 16 years of lunar ranging on the 2.7-m telescope, the system was moved to an 0.76-m mobile telescope known as the MLRS. The MLRS was operational until 2019 when the system succumbed to multiple lightning strikes. By then, NASA’s SGP and UT Austin’s CSR had already begun construction of the now operational VLBI site and the SGSLR site, both located at McDonald Observatory.



MGO located in the Greater Big Bend International Dark Sky Reserve.



What is the contribution of UT Austin to MGO?

CSR is the contract holder for NASA's SGP, which supplies the funding and scientific knowledge that allows McDonald Geodetic Observatory to operate. The partnership with McDonald Observatory allows MGO to operate in an environment that has dark skies and almost no radio frequency interference. The site is located within an "International Dark-Sky" location, which allows laser ranging to be completed, and it is also in a radio silent area with no cell phone reception and very few other radio frequency interruptions for VLBI operations.

Which observation programs does MGO participate in?

MGO VLBI is currently included in the weekly VGOS (VO) series and we also observe a weekly Intensive session on a baseline with Wettzell-South. At times, we are also performing SDE's (Single Dish Experiments) which aide in gaining more insight into the antenna's performance for both mechanical limits and RF observations.

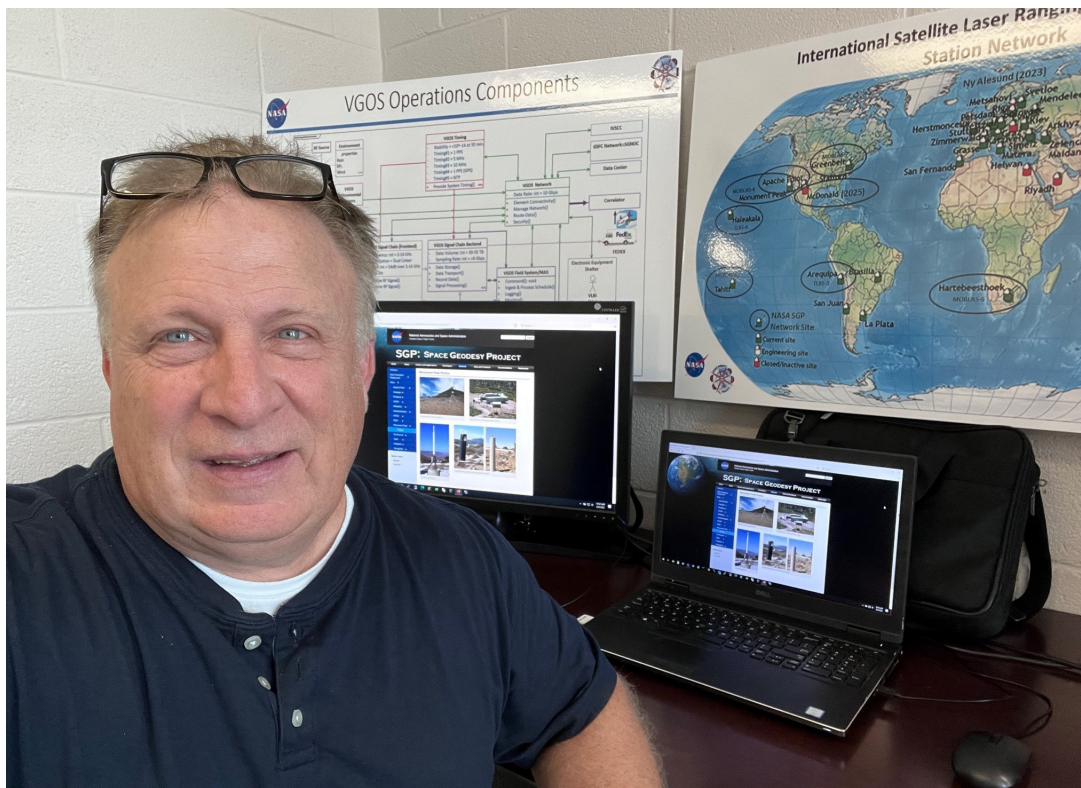
Who are the staff members working at the site and what are their functions?

Currently, MGO employs two onsite technicians/operators: Renny Spencer (pictured to the right of the antenna on page 5) and myself (pictured

to the left of the antenna). Renny Spencer comes to us with a wealth of knowledge as a mechanical technician and has been fully trained on VLBI operations. Both Renny and myself worked for the HET (Hobby-Eberly Telescope), an 11-m segmented optical telescope located here at McDonald Observatory, for many years before transitioning to the MGO. We also rely heavily on our staff located in Austin at the Center for Space Research. We couldn't do our tasks onsite without the support of Burke Fort, John Ries, Randall Ricklefs, Shauna Pendleton, and our administrative staff. The Austin staff's support allows the onsite operators to continue our work and keep the site operational.

What are the benefits for UT Austin to be part of the McDonald Geodetic Observatory?

So, MGO is used as an en-route for other colleges and departments that study geodesy to have access to McDonald Geodetic Observatory's site and perform various studies and experiments. We have partnerships with University of Texas's Jackson School of Geosciences, which runs multiple geoscience experiments including a superconducting gravity meter, and we are also currently working with UT's Applied Research Laboratories which is running an experiment that involves the local VLBA site.



Jeff Dorman: the NASA SGP Operations manager.

What is your special interest professionally but also in leisure?

My special interest professionally is making sure MGO is successful as a geodetic observatory now and into the future. Personally, or as a leisure activity, I enjoy wrenching on and riding motorcycles as well as repairing and riding my off-road jeep and spending time in the great outdoors.

Jeff, can you introduce yourself?

Sure. I am the NASA SGP Operations manager for the network of stations that support satellite laser ranging and VLBI scientific research and technology. My academic background is in earth and atmospheric science from the University of Nebraska. More generally, I learned how to support NASA mission operations through an assortment of computer engineering projects assigned to me in NASA GSFC's Systems Software Engineering

Branch at the Wallops Range Control Center at Wallops Island, Virginia. I am attached to support SGP operations and engineering through my GSFC employment with the Computing Environments and Space Technologies Branch.

What was the reason to set up a geodetic observatory at McDonald?

The observatory facilities at MGO represent a pioneer in space geodesy research since the 1960s. It resides at the base of Mount Locke in an arid, sparsely-populated area in the mid-section of North America and offers a strategic location in the network of stations that SGP supports. Affiliation with the UT Austin also provides educational outreach benefits with SGP.

What other geodetic techniques exist or are planned at MGO besides VLBI?

Beyond VLBI, the observatory operates several Global Navigational Satellite System (GNSS) stations and NASA is in the process of building a new Satellite Laser Ranging station that replaces the now-decommissioned MLRS legacy system.

In geodesy the network configuration always is of interest. What were the dominant site selection criteria for MGO?

The long history of geodetic data from the site and the partnership with the University of Texas were the primary factors in the selection, but we also included over a dozen other factors, including site stability, cloud converge, RFI, and available infrastructure.

What are the objectives with running MGO?

MGO is considered a core NASA site that contributes vital data for the ITRF. The VGOS station provides essential VLBI coverage over the Western United States, and our goal is to increase the number of sessions as the overall VGOS network matures. Finally, once the SGSLR station is up and running it

will once again provide essential satellite tracking data over the Western United States.

What is the contribution of NASA to MGO?

NASA provided all the geodetic instrumentation at MGO as well as the financial support to UT Austin for its operation. NASA also provides remote technical support from the Space Geodesy Project sustaining engineering team and will sometimes send repair and maintenance teams to the site when needed. NASA also maintains a depot of spare parts that can be shipped to the site.

Once work stops, what is your leisure activity?

The SGP assignment is great. The people, science, engineering, and operations teams are all first-class; I wish it would never end. When it does, however, I plan to spend more time surf-fishing Assateague Island and fishing the Chesapeake Bay. Any other recreational time left over will be spent on the golf course teaching myself humility.

Thank you both for the interview. It was great to learn about the VLBI activities in Texas.



Chevo & Renny: MGO's two on-site technicians.

Filters Everywhere

Alex Burns and Mike Poirier
MIT Haystack Observatory

OK, I'm not talking about Snapchat. But there are a lot of filters at a VGOS telescope site. We are responsible for ensuring our equipment is operating at peak efficiency, so don't forget about all of those fans, soldiering away inside their boxes, and diligently cooling all of those chips and power supplies. Also, though you may go on holiday to sunny Saint Tropez, those fans never get a break! These fans have to run all day and all night; so, give them some attention and make sure the dust collecting filters are cleaned. You can use a normal vacuum cleaner but be aware if you are going near any circuit boards, that ESD (electrostatic discharge) builds up quickly. I would recommend just cleaning the filters that are on the outsides of any equipment cases.

At Haystack, we take care of the R2DBE, which has two fan screens in the front. We also have the Mark 6 units, which have the screen in the front, and also the two sneaky-screens on the sides, only visible by taking the Mark 6 recorder out of the rack about 20 cm. We have our Mark 6 units on a rack-mounted slide system because they are



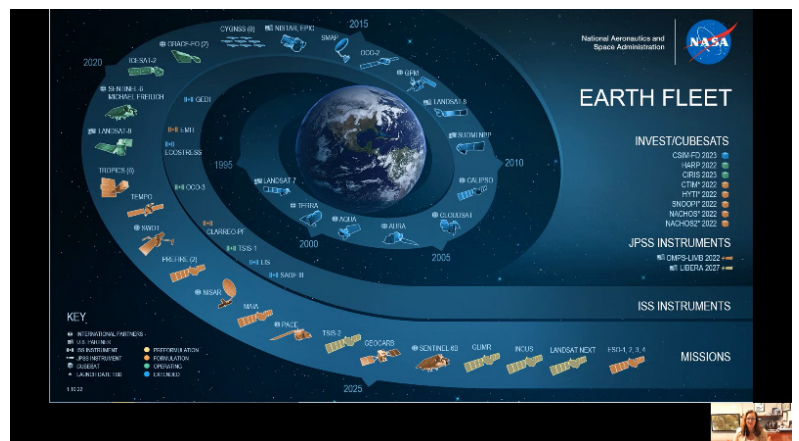
That's gross. Clean it up. Full disclosure: this image was NOT taken in the Westford control room.

heavy! Don't forget about the climate control for your control room as well, because dust filters are also there. No sense in spreading dirty air around and using the Mark 6 like a vacuum cleaner!

There is also a filter in the cryogenic system. Inside our M125 compressor is an adsorber (now they can come from Trillium, or Edwards sells the CTI-Cryogenics flavor, and probably more companies). This filter is good for one year, or 10,000 hours of service, to keep oil and contamination out of the helium that keeps those LNAs cool. Changing the adsorber is made pretty easy by the self-sealing connectors used. Follow the procedure for your helium compressor manufacturer.

Critical Role of Geodetic Infrastructure Highlighted at UN-GGIM

Dr. Karen St. Germain, the Earth Science Division Director at NASA Headquarters, presented “the critical role that geodesy and the global observatories play in Earth observation” at the Twelfth Session of the United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM) on August 2, 2022. The recording is available on the SGP website at <https://space-geodesy.nasa.gov/multimedia/videos/ExploreEarth/ExploreEarthVideo.html>.



GGAO Successfully Replaces Jackscrew of 12-m Antenna

Jeff Dorman
NASA GSFC

A new jackscrew and gearbox assembly were installed successfully on the 12-meter VGOS antenna system at NASA Goddard Geophysical Astronomical Observatory (GGAO) in Greenbelt, Maryland during the week of June 6–10, 2022. The 12-m antenna is the original prototype VGOS system developed by the NASA Space Geodesy Project (SGP) that was used to demonstrate the feasibility of broadband VLBI and is continually used today as part of the ever-expanding VGOS network. The GGAO site operations and engineering management team from Peraton, antenna repair technicians from Intertronics Solutions, Inc. (ISI)–Calian in Quebec, Canada and heavy equipment operations personnel from local contractor United Rigging in Beltsville, Maryland supported the repair activities that had been delayed for 20 months because of COVID-19 related challenges.

A broad range of skilled activities had to be completed. This included the heavy equipment operation of lifting and securing a 30-foot steel beam on a gantry platform to the antenna reflector bottom (see figure). On the first two days of on-site repairs, the team performed several critical tasks that prevented an accidental reflector tip-over mishap during removal of the old jackscrew. This included the temporary removal of the elevation motor assembly and release of the secondary elevation brake to allow the reflector to rest on the beam while two strategically positioned bottle jack support devices were installed on the back side of the turning head (see figure).

After stabilization of the dish and other precautionary measures, Day 3 was highlighted by the methodical, surgical extraction of the jackscrew from the turning head assembly using a forklift fitted with a jib-boom and slowly lowering it to the ground using ratchet straps and guide rope for assistance. By the end of this day, the old jackscrew was safely removed from the antenna turning assembly (see figure).

Then, finally, on Day 4 the new jackscrew could be lifted into position, installed, and proven to pass load testing. The gantry and other heavy equipment were removed before further testing was performed such as inspecting the elevation motor currents over the full motion range. These tests detected elevated motor currents with increasing elevation; however, this was resolved replacing the secondary brake assembly. Continued inspection of the antenna performance showed that the motor currents were about 20% above typical values. This was attributed to a break-in period for the new jackscrew assembly.

GGAO operations resumed on June 14, 2022 with a successful observation of y22165 together with Yebes. The replacement of the jackscrew has improved the overall structural and motion integrity



ISI technician inspecting the bottle jack and support beam installation prior to the jackscrew removal.

associated with antenna pointing and ensures continuous VLBI scientific research contributions from the NASA/SGP network. SGP plans to continue the refurbishment of its GGAO 12-m antenna, the next step being an upgrade of the receiver in August 2022.

It was great to see the team work together to get the repairs completed successfully and safely. Now we can move forward and focus on other improvements to GGAO as well as other SGP sites with support from our science and engineering partners at MIT, NVI, and Peraton. For more information regarding NASA/SGP activities and scientific contributions see <https://space-geodesy.nasa.gov/>.



GGAO 12-m antenna following removal of the old jackscrew.

Meetings

REFAG 2022
Thessaloniki, Greece
October 17-20, 2022

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

GGOS Days 2022
Munich, Germany
November 14-15, 2022

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



GGAO 12-m antenna with the new jackscrew.

Updating the vgosDB Naming Convention

Christopher Dieck
U.S. Naval Observatory

The current vgosDB naming convention (e.g., 22AUG01XU) has been in use for many years. However, there are ways that IVS components would like to operate that are restricted by the current naming convention of the vgosDBs. To remove these constraints and allow for more flexibility into the future, an Ad Hoc Working Group, formed at the March 2022 IVS Analysis Workshop, has put forth a proposal to modify the naming convention of vgosDBs and the format of the IVS Master File. These changes are needed to remove the barriers that exist in our current operations. Additionally, as the proposal states, our collective effort to implement the proposed changes is necessary “to ensure the ability of the IVS to adapt to the challenges and opportunities of the future.”

The proposal outlines the following deficiencies of the current vgosDB naming convention:

- Multiple correlator releases of the same session cannot be easily distinguished from each other.
- It is challenging to represent multiple sessions of the same type that are observed on the same day (e.g., multiple VGOS Intensives).
- The name is not future-proof; names may be duplicative as early as 2079.
- The name does not filter well.
- The name does not sort well.

Numerous suggested adjustments to the convention have been discussed at multiple meetings and workshops, culminating in the Working Group’s proposed modifications to the IVS Master File format as well as the vgosDB naming convention. Though the changes are relatively minor, they affect nearly every element of the IVS because of the centrality of the Master File. The opportune time to change the format of the Master File is by

November 1, 2022, when the file for 2023 is re-released. From now until then, almost all IVS components will have to update some element of their software. Then, in November and December, the IVS community can test their updated workflows to ensure a smooth transition to the new Master File format in 2023.

After the transition to the new formats, some of the benefits of the changes will be immediately noticeable while others will require additional effort to enable. The Working Group has already identified two such endeavors. First is the creation of a utility to update a vgosDB from the original naming convention to the new naming convention so that all sessions may conform to the same convention. Second is to develop the capability to merge vgosDBs of the same session produced by multiple components into one vgosDB held at the IVS Data Centers. Individuals with interest in supporting these projects are encouraged to reach out to the Working Group. Along with the known and anticipated benefits of the transition, it will be exciting to see what other innovations will be possible because of the added flexibility of the new vgosDB naming convention and Master File format.

The advancements that the IVS has made over the decades have been because its components have come together to achieve a shared goal. This undertaking is no different. Our collective effort to implement the changes to the vgosDB naming convention and the Master File format over the remainder of the year will have immediate positive impacts and help to prepare our continuing endeavors for success for decades to come.

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

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