

# IVS NEWSLETTER

## ISSUE 65, April 2023



### General Meeting on the Horizon

After the GM2020 was cancelled and the GM2022 was held virtually, all systems are go for the General Meeting 2024 in Japan to take place in person. We hope that many IVS members will travel to Tsukuba in the first week of March 2024 to participate in the GM but also to celebrate the service's silver jubilee in an accompanying festive event. The official inauguration date of the IVS was March 1, 1999, which means that the community will assemble almost exactly 25 years later to the date. Find out more about the 13th IVS General Meeting on Page 5.



### News Around the IVS

*Dirk Behrend*

*NVI, Inc./NASA GSFC*

In the last several months, a number of things happened that impacted the IVS Directing Board as well as the IVS at large. Auckland University of Technology divested itself of Warkworth Observatory effective mid-December 2022—a culmination of developments over the course of the year. Recognizing the vital role of this southern hemisphere station for the global VLBI network, the New Zealand Government provided interim funding to establish a consortium and to find a new funding mechanism to keep the observatory running. This interim funding is scheduled to run out at the end of June 2023. At this stage, it looks very promising that a public–private partnership can be set up between Space Operations New Zealand Ltd (SpaceOps) and Land Information New Zealand (LINZ) to continue operations at the site.

Because of the situation at Warkworth Observatory, Stuart Weston stepped down from his position as IVS Network Coordinator. We thank Stuart for his service over the past 2.5 years in this role. The IVS Directing

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Board elected Alexander Neidhardt from the Geodetic Observatory Wettzell as Stuart's successor, effective at the end of January 2023. Thanks to Alexander for taking on this important role.

Finally, the IVS Directing Board elected the new At-Large members on the board for the two-year term from February 2023 through February 2025. The new members are: Hayo Hase (Argentina/Germany), Masafumi Ishigaki (Japan), and Fengchun Shu (China). Welcome aboard!

## RAEGE's Santa Maria Station on the Azores

Portugal has recently been added to the list of member countries of the IVS. As part of the Spanish/Portuguese RAEGE endeavor, Santa Maria Station on the eponymous island of the Azores archipelago has become the second station of the RAEGE network that reached operational status. Newsletter editor Hayo Hase interviewed João Salmim Ferreira, the station manager of Santa Maria Station via email. Here is an excerpt of the exchange, slightly edited for clarity.



Santa Maria Station Director João Salmim Ferreira.

*João, how did it happen that Portugal started with VLBI on the beautiful Azores islands?*

To be fair, I have to say that having VLBI stations in the Azores was, at the very beginning, a dream of the IGN Spain (National Geographic Institute of Spain), our partners in the RAEGE Network (Portuguese/Spanish acronym for Atlantic Network of Geodynamic and Space Stations). The RAEGE initiative motivated the Regional Government of the Azores to take part in this endeavor. And with time the Government of the Azores has learned to value and to take advantage of the infrastructure and knowledge about space geodesy. Moreover, this investment provides essential data for political agents to promote the protection of the people and territory. Considering that the Azores archipelago—the heart of the triple-junction between the Eurasian, North American, and Nubian tectonic

plates, with active vulcanism and a considerable seismic activity—is surrounded by the Atlantic Ocean and therefore extremely vulnerable to natural disasters and climate change effects, it makes sense to invest in this kind of infrastructure and equipment. The challenge is the same for all of us—convince decision makers that funding a global effort will pay off locally.

*Which Portuguese institutions are involved in Santa Maria? Is the mapping authority of Portugal involved?*

The RAEGE Station of Santa Maria is managed by 'RAEGE-Az – Associação RAEGE Açores,' an entity created by the Regional Government of the Azores in 2017, with close support and supervision by IGN Spain. Through the years, RAEGE-Az established numerous partnerships and agreements with various entities, including national universities, research centers, and civil authorities, that share a common interest in geodetic data or geodetic activities. Neither the Portuguese mapping authority nor the Government of Portugal are directly involved.

*From the first light until now, what have been the major achievements?*

The biggest achievement is the amazing team we managed to assemble in Santa Maria. Thanks to them the station has evolved and improved at a great pace, especially in the last two years. As for major achievements, I must highlight the extensive structural and mechanical maintenance works performed in 2020 and early 2021 that allowed the radio telescope to rejoin the IVS legacy S/X network as an operational station; the installation of the new VGOS broadband receiver in October 2022, hopefully allowing us to be part of the VGOS network soon; and the contribution of Santa Maria to the ITRF2020.

*Following the concept of co-location of instruments, what kind of complementary instruments are at your station?*

We have two permanent GNSS stations (RAEG00PRT and AZSM00PRT), a seismograph Trillium 120 PA, an accelerometer Silex (IGN-Spain design), and, since October 2022, a superconducting gravimeter GWR iGrav, the first of this kind in Portugal. We are



*An aerial view of Santa Maria station.*

currently studying the possibility of installing a DORIS station in Santa Maria. Unfortunately, the Azores is not the most suitable place for an SLR station, as there aren't many clear nights per year (probably less than 180 nights) to operate an optical sensor.

*For the terrestrial reference frame, local ties play an important role. Did you do a local survey?*

We are working on creating the local tie infrastructure between the GNSS stations and the VLBI radio telescope. With support from IGN Spain, we performed a local survey in 2022 to establish the positions of the survey pillars and, this summer, we intend to launch their construction.

*Who is working with you at the Santa Maria station?*

What an amazing team we were able to gather in Santa Maria—young but willing to make a difference. Looking at the actual group photo: In the top row first is Diogo Avelar, working at the station since February 2021; he has an MSc in Electronics & Telecommunications Engineering and is originally from the island of Flores. Second is Mariana Moreira, with us since November 2020;

she has an MSc in Aerospace Engineering. Third is Valério Pacheco, working here since early 2019, with vocational training in Automotive Mechatronics. Next is Elsa Melo, with us since October 2021, with vocational training in Administration. Lastly, there is Sérgio Chaves, with us since January 2021 with vocational training in Automotive Mechatronics.



*Santa Maria staff. Top row: Diogo Avelar, Mariana Moreira, Valério Pacheco, Elsa Melo, and Sérgio Chaves. Bottom row: João Salmim Ferreira, Abel García, Valente Cuambe, and Nuno Mata.*

The remaining four members all hail from Santa Maria. In the bottom row, there is me, working at the station since January 2020, with an MSc in Aerospace Engineering and originally from Portugal mainland (Ribatejo region!). Secondly is Abel García, with us since March 2021; he has an MSc in Telecommunications Engineering and is a native of Gran Canaria Island. Third is Valente Cuambe, who started in October 2021, with a PhD in Astrophysics (specialized in Solar Physics), originally from Maputo in Mozambique. Finally, there is Nuno Mata, a native of Santa Maria, who started in 2018, with vocational training in Networks and Computer Systems.

Elsa is the Administrative Officer, working on accounting and general administrative tasks. Nuno is the IT Technician, and Sérgio and Valério are the

Maintenance Technicians. The R&D and technical coordination team is composed of Mariana; she deals with VLBI data analysis and is also part of RAEGE Analysis Group. Diogo and Abel give hardware and software support in VLBI operations and the signal chain technological improvements. Valente is the astronomer on duty to support VLBI operations. I am the Santa Maria Station Director and currently also the Deputy Director of the RAEGE network (with José A. López-Pérez). I am responsible for coordinating all the activities at the station. The technical coordination team and I are also in charge of the operations of the radio telescope via shifts.

*Do you have plans to set up an Analysis Center (in Portugal) to process VLBI data?*

For now, we don't have plans to set up an Analysis Center in Portugal. Within the RAEGE network, Santa Maria staff are supporting the installation of the Analysis Center at the Yebes Observatory.

*I guess you do a lot of electronic transfer of data to the correlator. What bandwidth is available to you?*

As a matter of fact, we have only done e-transfer of data so far. Currently, the station's bandwidth is 480 Mbit/s; but we are working to double it in the near future to cope with VGOS requirements. Ultimately, we are limited by the submarine communication cable that connects the Azores archipelago to the Portugal mainland and the Madeira islands. The replacement of the submarine cables is currently under political discussion and is expected to begin in 2024 or 2025. We hope that would allow larger bandwidths.

*How do you get to Santa Maria? Are you commuting between the continent and the island?*

It is not as hard to reach Santa Maria as people usually think. There are direct flights from Lisbon to Santa Maria twice a week. Or one can fly first to São Miguel (the nearest and the biggest island in the Azores) which has direct flights for several destinations

(especially during high season) including Boston, New York, Toronto, Lisbon, Porto, Madrid, Paris, the United Kingdom, and Germany, among others. The transfer flight from São Miguel to Santa Maria takes 20 minutes.

*I assume that you live on the island most of the time to do your job at the station. How is living in the middle of the Atlantic Ocean?*

Living in Santa Maria is quiet. We have a high quality of life because every point is 30 minutes by car at most. The island has around 5,500 inhabitants and an area of 92 km<sup>2</sup>. It is true that there are a lot of



*The Superconducting Gravimeter at Santa Maria.*

limitations and not many cultural or other activities are offered, but people are used to doing what they have access to. In the summer, we have sunny beach days and lively music festivals. If there is bad weather, we won't have fresh food in the supermarket and shipments may take one month instead of one week, until the weather gets better and allows the ship to dock. People usually say that things occur at their own pace in the Azores and that is true; we adapt and learn that things won't occur always when we want or when we think they should. It's a beautiful island where you can see the ocean from almost everywhere, which can be a wonder and at the same time make people feel isolated. It's also this contrast that makes Santa Maria a

unique place.

*When you are not absorbed by your multiple duties, what kind of leisure activities are yours?*

I'm crazy about tennis, and together with some locals we were able to create a small tennis team within a local old football club—the Grupo Desportivo Gonçalo Velho. I like to surf, jog, and hike in nature. I also enjoy the summer festivities and the well-known international music festivals.

*Thank you very much for the interview.*

# IVS Celebrating Silver Jubilee at GM2024 in Tsukuba

Masafumi Ishigaki and Yu Takagi  
GSI Japan

The 13th IVS General Meeting will be held during March 4–8, 2024, in Tsukuba, Japan. The year 2024 also marks the 25th Anniversary of the IVS, which we will celebrate in a commemorative event. All IVS Associate Members and individuals who have interests in the application of VLBI in the fields of geodesy and astrometry are welcome to attend the meeting. Beyond the two main events, an Analysis Workshop, an IVS Directing Board meeting, and other splinter meetings will take place.

The city of Tsukuba is located about one hour by train from Tokyo and about one hour by bus from Narita International Airport. It is known as a ‘science city’ with many research institutions, such as the Geospatial Information Authority of Japan (GSI), the University of Tsukuba, and the Japan Aerospace Exploration Agency (JAXA). In 1985, an International Science and Technology Exposition was held in Tsukuba attracting around 20 million Japanese and foreign visitors.

You can see Mt. Tsukuba from everywhere in the Tsukuba city area. It has been familiar to many people as a sacred mountain since ancient times and is described in Manyō-shū, which is the oldest collection of Japanese poetry written more than 1,000 years ago. From the middle of February to the beginning of March, the foot of the mountain is filled with plum blossoms and the Mt. Tsukuba Plum Festival is being held. March in Tsukuba, when the meeting is scheduled, is the month when winter ends and spring begins. The weather is usually favorable; however, the temperatures can be a little cool with daytime highs at 14°C and nighttime lows at 2°C.

The Ishioka VLBI station is about 40 minutes from the center of Tsukuba by car. We plan to have an excursion to visit the site. There is easy access from Tsukuba to many famous places in



View of Mt. Tsukuba.

Tokyo by train (via the Tsukuba Express railway), including Asakusa, a Japanese traditional town, and Akihabara, which is famous for its many electronics shops and being the center of Japan’s “otaku” culture.

We hope that we have a successful meeting and that you can fully enjoy Tsukuba and Japan during your stay. We are looking forward to meeting you all!



Cable car at Mt. Tsukuba.



*Cityscape of Tsukuba Science City with Mt. Tsukuba in the background.*



*Plum trees in bloom on Mt. Tsukuba.*



*Entrance to the Tsukuba Express railway.*

## Meetings

EGU General Assembly 2023  
Vienna, Austria  
April 23-28, 2023

Twelfth IVS Technical Operations Workshop  
Haystack Observatory  
Westford, MA, USA  
April 30 - May 4, 2023

26th EVGA Working Meeting  
Bad Kötzing, Germany  
June 12-16, 2023

28th IUGG General Assembly  
Berlin, Germany  
July 11-20, 2023

Journees 2023  
Nice, France  
September 11-13, 2023

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

# Fortaleza Returns to VLBI Operations

Jeff Dorman, GSFC

Adeildo Sombra da Silva, Mackenzie

The 14.2-meter antenna at Fortaleza Geodetic Observatory (FGO) in Eusebio, Brazil, took a giant step to rejoining IVS observations with the recent installation of a new main azimuth bearing in February 2023. Originally installed in 1993, the TIW Systems antenna has now seen two azimuth bearing replacements, with an earlier one completed in 2010. The latest failure happened in November 2020 because of unusual outer raceway grinding and poor load transfer through the roller elements.



FGO 14.2m Antenna at Fortaleza Geodetic Observatory (FGO).

The new 500-kg bearing was manufactured by ThyssenKrupp in Ohio, USA, in August 2022 and delivered to FGO in November 2022. The FGO station manager Adeildo Sombra da Silva, together with engineering and heavy equipment support provided by local Brazilian contractors Revtech and Tomé, prepared the installation and lift plans to execute the work safely. NASA safety engineering reviewed and approved the plans prior to the start of repairs on February 6. The allotted time for the repair was seven days.

Collaboration between all groups was critical. On Day 1, the team strategically placed the support beams and four hydraulic gantry units beneath the 50-ton antenna dish. This mobile gantry system, riding along a connected set of rails, allowed for a lateral shifting of the antenna away from the pedestal and a lowering of the unit near the ground. From here, the engineering technicians could

safely move the azimuth motors for clearance to remove the old, damaged bearing.

On Days 3 and 4, with the antenna lowered, the team installed and positioned a machine lathe on the antenna surface where the top of the bearing is attached. A meticulous rotation of the lathe is a critical task because the bearing requires a flat and even surface (within a 0.05 mm deviation) to meet manufacturing-recommended specifications for achieving 15–20 years of life expectancy.

Following the machining task, the new ThyssenKrupp azimuth bearing was bolted securely to the surface. ISI-Calian engineering representatives inspected the bolting and monitored the surface measurements during the lathe milling operation. On Days 5 and 6, the azimuth motors were assembled and returned to their proper positions. A crane moved the lathe equipment and re-positioned it above the pedestal. In this position, the lathe could execute a similar milling task on the bottom mounting surface to achieve the flatness goal. The antenna was returned and attached to its original position on Day 7 to complete the repair activities.

With a new azimuth bearing successfully installed, station management can now remount a refurbished receiver and perform configuration and pointing exercises needed to resume operations and provide quality VLBI observations.



(left) Gantry and Beam System for Lifting; (right) Rolling Gantry and Lowering Antenna.



Removing the Damaged Azimuth Bearing.

The expected return to operations is April 17, 2023.

The geodetic science and research conducted at FGO is supported by NASA/SGP as well as the National Institute for Space Research (INPE) and Instituto Presbiteriano Mackenzie in Brazil. For more information, contact Adeildo Sombra da Silva (FGO station manager, [adeildo.silva@mackenzie.br](mailto:adeildo.silva@mackenzie.br)) or Stephen Merkowitz (NASA/SGP manager, [stephen.m.merkowitz@nasa.gov](mailto:stephen.m.merkowitz@nasa.gov)).



New Azimuth Bearing following Installation.

## IVS Stations in a Post-COVID World

*The unprecedented COVID-19 pandemic severely affected day-to-day life in countries around the world. With the advent of vaccines, and with sufficient social distancing, life slowly began to form a semblance of our pre-pandemic lives. Below are examples of three stations across the world who saw normal operations return to normal while also experiencing changes to their work lives to keep COVID at bay.*

### **GGAO, USA by Katie Pazamickas, Peraton**

On May 15, 2022, Goddard Space Flight Center returned to “normal” to return to a post-pandemic world. At GGAO, however, not much has changed. Peraton personnel had continued regular operations and maintenance with the 12-m VGOS antenna throughout the COVID-19 pandemic, although some larger projects did get put on hold.

Now that the world is emerging from the pandemic, site personnel have been able to support visitors and get to work. Some of the larger scale projects include replacing the jackscrew on the 12-m antenna, a completely new and upgraded network, and plans for an evaluation and upgrade of the 12-m VGOS receiver. All of this represents a post-pandemic era where VGOS development and progress has resumed while the ongoing maintenance and regular observations continue as they have since the installation of VGOS at GGAO.

### **Ishioka, Japan by Yu Takagi, GSI**

In the three years after the COVID-19 pandemic outbreak, it has become standard in Japan for everyone to keep a social distance, wear a face mask, and use hand sanitizer placed in various places.



You may remember that the Olympic Games were held with no inspectors in Tokyo in 2021. In Japan, a total of 12.6 million people (the population of Japan is about 126 million) were reported to have been infected by the end of July 2022. Most recently, the number of infected has been rapidly increasing. However, restrictions on behavior are being eased.

Fortunately, none of the Ishioka VLBI staff has been infected. Vaccinations are progressing, and everyone has received two to three vaccinations. Currently, staff members are working at the office and sometimes from home to run the operations of the antenna.



*(From GSI's video about local-tie survey) Determining the VLBI reference point of the Ishioka antenna by measuring distances and angles to a target on the moving dish using a total station that is physically fixed to the ground.*

Over the past two years, the antenna has experienced several problems. The pandemic forced the manufacturer's engineer to respond online because traveling was limited; so it took some time to fix the problem. It might be one of the negative aspects of the pandemic. At present, the operation is running without significant issues.

During the pandemic, we conducted local-tie surveys on site with care of infection. The result for 2020 was submitted to IERS to contribute to ITRF2020. In 2021, we also worked with GGOS

Japan to create a video introducing the local-tie survey, which can be seen on YouTube ([https://www.youtube.com/watch?v=oG4\\_FxtLh0E](https://www.youtube.com/watch?v=oG4_FxtLh0E)).

The pandemic has brought about significant changes in the way we work. Working from home is no longer a rarity; many meetings are now held online. In this sense, it has brought new values. We are considering making more use of online tools for more efficient operations.

Meanwhile, traveling abroad, which has been difficult in the past, is gradually easing; some GSI



*(From GSI's video about local-tie survey) Determining local height differences with geometric leveling.*

staff are attending on-site meetings abroad. VLBI staff will also be able to travel overseas to participate in face-to-face meetings soon, and we are looking forward to seeing you.

### **Seshan, China by Fengchun Shu, SHAO**

After a massive COVID outbreak within one month, Shanghai has been back to normal life in 2023. The station staff continued the maintenance work to replace broken chains. It is hopeful that Seshan25 can be operational for another five years. Though there are still many online meetings, more and more face-to-face meetings are to be held. The domestic business trips have since recovered to the level before COVID. Meanwhile, some colleagues are planning international travel.

# TOW Time Again

Alex Burns

MIT Haystack Observatory

As we prepare for the first in-person Technical Operations Workshop, or TOW, on the other side of a global health crisis, it has made me reflect on VLBI and our place in it. We study the Earth, and VLBI is a global effort; but even that does not make up for the isolation of communicating by email and Zoom. As we prepare to get together at Haystack again, I am more grateful than ever to get to see all the station personnel from around the world, as we learn from and teach each other what we have learned over the last two years. I was fortunate to travel to a few sites in the “before-times,” before COVID-19 shut down the world. Every visit and every chat with an operator was an opportunity to learn something new. With the TOW, it is an amazing time to meet old friends and see the new group of operators taking the mantle for the next 50 years. And it all happens inside one week!



It is easy and dangerous to fall into a routine with operations. Whether your site does daily Intensives or only runs for one session every other week, the schedule can lull you into a false sense of routine that makes you stop looking for system enhancements or new ideas. The TOW is a great time to see what other sites have dreamed up, like a nice plot window to make displaying data easier for an operator, ultimately making the network of stations even more reliable and robust. There is a myriad of small improvements that we can all make to keep our sites optimized and increase our uptime.



Maybe it is as simple as catching up on basic maintenance or taking a deep dive to inspect some of the oldest equipment at your site. If you are not savvy with software, talk to one of the many experts that we have; but use your skills, whether they are mechanical, or writing, or something more creative to contribute. Be sure you wake up your routine and look where your site can use a little attention and TLC.

The technical aspects of TOW aside, the friends that we have made in the community are even more important for me this year. If you work at a radio telescope, at some point something has broken. Sometimes you get very lucky—and many things break at the same time! When that happens, there is always a willing helping hand just a phone call or email away. At your local site there is probably an experienced operator that you can rely on; but know that if you reach out into the wider community, you will be able to find help for anything that you need. These helpful folks will become like an extended family. You may not see them very often, but it is always a nice time when you do.

I hope you are all looking forward to getting together as much as I am, and we will see each other in May at Haystack!

## In Memory of Ojars Juris Sovers (1937–2022)

[Ojars Juris Sovers](#), one of the key contributors to the development of VLBI for astrometry, geodesy, and spacecraft navigation, died on 11 November 2022 at his home in Florence, Oregon surrounded by family.

He was born to Karlis and Olga (Kaneps) Sovers in Riga, Latvia in 1937.

In 1950 he immigrated with his parents to the U.S. He finished a bachelors degree in physics and chemistry from Brooklyn College in 1958.

In 1959 he married Zinta Aisters whom he met at Brooklyn College and with whom he spent the rest of his life.

In 1962, he finished a PhD in physics and physical chemistry from Princeton

followed by post-doctoral work at Oxford and Columbia Universities.

He worked at GTE labs from 1964 to 1972 and at Sony in Tokyo, Japan from 1972 to 1978.

In 1979 he was recruited by Eri Cohen to join the JPL VLBI group.

VLBI became the focus of the rest of his professional life. He developed the VLBI software [MODEST](#), based on Jack Fanelow's [MASTERFIT](#). Ojars was known for including detailed documentation—much appreciated by his users.

Ojars was also early to realize the value of GNSS for geodesy and its synergy with VLBI. By 1988, Ojars and Jim Border had written JPL's first [modelling code for the analysis of GNSS data](#).

Starting in the 1990s, Ojars was a member of the ICRF working groups which produced [ICRF1](#) and [ICRF2](#). Ojars is perhaps best known for the review of

VLBI modelling in [Reviews of Modern Physics](#) (1998) which has been a standard reference.

In 1998, Ojars and his wife, Zinta, who often joined him at IVS meetings, moved to Florence, Oregon, from where Ojars continued VLBI work for JPL as a contractor for Remote Systems Analysis alongside Jack Fanelow.

In 2000, Ojars & Hans Walter co-authored "[Astrometry of Fundamental Catalogues](#)" covering the transition in astrometry from optical star measurements to radio VLBI measurements of extragalactic sources.

In the decade of the 2000s, Ojars was part of the teams that initiated celestial frame work at other radio frequencies: at [K and Q-bands](#) led by Gabor Lanyi and Chuck Naudet, and at [X/Ka-band](#) with Chris Jacobs. K and X/Ka-bands became an official part of the [3rd ICRF](#) in 2018; work at all three bands continues to this day.

In 2015, Ojars fully retired to spend time enjoying life with his wife, extended family, and friends and colleagues.

His legacy is carried on by many including two IVS members whom he mentored and who went on to chair the 3rd ICRF working group: Chris Jacobs and Patrick Charlot who was his post-doc at JPL in 1989–1990.

On January 21, 2023 family, friends, and colleagues from around the world gathered to celebrate the life of Ojars Sovers remembering him for his many accomplishments, intelligence, dry humor, generosity, kindness, and his love for his family and friends. We are so very fortunate to have known him. He will be missed.

*Chris Jacobs, Pasadena, California*



*Ojars Juris Sovers (1937-2022)*

The IVS Newsletter is published three times annually, in April, December, 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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