

IVS Newsletter

Issue 26, April 2010



TIGO Survives Chilean Megaquake

– Hayo Hase, BKG/TIGO Concepción

On February 27, 2010 at 03:34 in the morning, a major earthquake of magnitude 8.8 struck the central south region of Chile. The shaking of the Earth lasted around 2 minutes and 15 seconds. The epicenter of the first waves was located at about 100 km north of Concepción. During the earthquake the epicenter moved along 500 km of the subduction zone (of the Nazca plate underneath the South-American plate). The seismic waves arrived in Concepción from the north, the west and the south, from the sea and from the continent. Three tsunami waves were observed at the Pacific coast within 4 hours after the earthquake.



(top) The protective unreinforced concrete pipe of the GPS/Glonass monument of the IGS station CONZ was destroyed in the megaquake. The reinforced concrete pillar itself, however, survived the event without damage. (below) Collapsed component of a bridge crossing the Biobío river in Concepción with crashed vehicles.

During the first three weeks after the earthquake more than 150 after-shock events of $M > 5.0$ were registered. Fifteen of them were larger than

$M6.0$ and two exceeded $M7.0$. While the Earth was looking for its equilibrium, the post-seismic movement has been very high.

Records of the GPS/Glonass IGS station CONZ at the Transportable Integrated Geodetic Observatory (TIGO) on the campus of the Universidad de Concepción showed a translation of as much as three meters. The direction of the slip was west-southwest. This is directly opposite the direction that

was measured for that monument during the period 2002–2010. The 1-s samples of GPS/Glonass data were continuously recorded, in spite of the fact that a general power failure, caused by the earthquake, paralyzed everything for more than two days. The GPS/Glonass data show that the three-meter slip occurred

during the first minute of the long quake event. The post-seismic movement continues towards the Pacific Ocean with velocities of 5 to 20 mm per day; this is equivalent to 1.8 to 7.3 mm per year!

The Geodetic Observatory TIGO is located in the neighborhood of a seismic gap zone between the towns of Concepción and Talca, in which the last big seismic event took place 104 years ago in 1906. It was expected that a major earthquake would happen again in the region following the largest earthquake ($M9.5$) of the 20th-century worldwide in the adjacent area around Valdivia (about 400 km south of Concepción) in 1960.

TIGO was developed in the 1990s in Wettzell, Germany and hosts the instrumentation of a fundamental station for geodesy, consisting of a radio telescope for VLBI, a Satellite Laser Ranging System, GNSS receivers, superconducting and absolute gravity meters, and a time-keeping laboratory based on frequency standards. The earthquake impacted the operation of the observatory: the containers were shaken and moved from their positions by the strong seismic surface waves. However, most of the equipment of TIGO survived the earthquake with only minor damages. The VLBI operation started again on March 15 with the R1422. In order to corroborate the post-seismic movements determined by GNSS, a temporary series of dedicated sessions was established by the IVS.

TIGO has supplied data to the international services (IVS, ILRS, IGS, BIPM-UT, IGFS, and IERS) prior to the seismic event for over eight years now. This fact opens a fantastic opportunity for the geosciences community to study the post-seismic behavior of the Earth in the context of global reference frames using current and future data taken at TIGO.

In Chile's center regions of Maule (capital: Talca) and Biobío (capital: Concepción), the earthquake is responsible for the destruction of quite a few buildings and civil engineering structures. About 300 schools and 24 hospitals show severe damage and need to be replaced. Compared to the magnitude of the earthquake the death toll is fairly low (slightly above 500 known deaths) thanks to the building code established after the 1960 earthquake. Many buildings withstood the quake saving innumerable human lives; but now these buildings will have to be rebuilt due to the damage they suffered. The rainy winter season is just around the corner and there is still a need for about 200,000 new houses. Four weeks after the big tremor, life starts to normalize again. But it will take years to rebuild cities and infrastructure.



Permanent Component

Urumqi Observatory in Western China

China's most-western province, Xinjiang Uygur Autonomous Region, is host to the Nanshan VLBI Station at the Urumqi Astronomical Observatory. Nanshan Station is a founding member of the IVS and is part of the Chinese Academy of Sciences. Urumqi, the capital of Xinjiang, is known to be the most landlocked city in the world—the furthest from any seacoast. The city has a population of almost 2.5 million and is about 2,000 miles from Beijing (a five-hour flight). It lies as a green-blanketed oasis amidst Xinjiang's barren and uninhabited deserts, loess highlands, and the snowcapped peaks of the Tianshan (Heavenly Mountains). Newsletter editor Hayo Hase e-interviewed the observatory's VLBI Friend, Xiang Liu, to learn more about the observatory, its VLBI activities, and future plans.



Xiang Liu, the Urumqi group is known in the VLBI community for many years now. But we know little about the individual people. How did you become a VLBI expert? What is your actual position?

I learned about VLBI when I was a graduate student at Shanghai Observatory from 1989–1992 majoring in VLBI astrophysics. Then I moved to Urumqi Observatory, where I have been working on VLBI observations since the 25-m antenna was built in 1993. In 2002, I got my PhD in VLBI astrophysics. My main position is VLBI scientist and I have been the

VLBI Friend at the station for many years.

Close to your station there is a landmark indicating the most continental point on Earth. How far is it from your station to the nearest seacoast?

Yes, there is a landmark close to our station, which marks the geographical center of Asia. It is about 2,380 km to the nearest sea, the Indian Ocean, and about 3,080 km to the Bohai Sea [the innermost gulf of the Yellow Sea] near Beijing, the capital city of China. The place is physically not stable according to the results from IVS observations. The telescope site has a plate motion of 1–2 cm/yr to the northeast probably due to the pushing motion of the Indian plate.

The nearest city is Urumqi, the capital of Xinjiang province. Your radio telescope is located outside of the city. Can you explain the different names used for your station: 'Urumqi' and 'Nanshan'? What is the distance between Urumqi and Nanshan?

Urumqi is the capital city of our province, the Xinjiang Uygur Autonomous Region of China. Our radio telescope is located at the 'Nanshan' mountain of Urumqi County, which belongs administratively to the city of Urumqi. So the telescope site is still within the area of Urumqi. The fact that the station has two names ('Urumqi' and 'Nanshan') is historically grown. 'Urumqi' as the better known geographical place is more often used in the VLBI community. The distance between Nanshan and downtown Urumqi is about 60 km.

Please give us some historical background information. When was the observatory founded? Do you have a connection to the local university, or is it just part of the Chinese Academy of Sciences?

The observatory was founded in 1957 as part of the Chinese Academy of Sciences. In 2001, it was formally renamed to 'Urumqi Observatory of the National Astronomical Observatories of CAS' and is thus affiliated with the NAOC. There is no formal connection to universities, but we have a joint research center on astrophysics that was founded as cooperation between Xinjiang University and the NAOC in 2009.

Who is who at Nanshan station? Please introduce the most important staff members.

Here is a list of main staff members at Urumqi/Nanshan VLBI Station (e-mail: add @nao.ac.cn to list entry):

Name	Position	Working area	E-mail
Na Wang	Professor	Station Chief	na.wang
Aili Yusup		Chief Engineer	aliyu
Xiang Liu		VLBI Friend, AGN	liuxc
Zhengwen Sun	Senior Engineer	receiver	sunzw
Maozheng Chen			mzchen
Minghui Shao		time & freq.	shaomb
Aili Esamdin	Scientist	astronomy, pulsar	aliyi
Jarken Esimbek		astronomy, lines	jerken
Jianjun Zhou			zbonjj
Wenjun Yang	Engineer	VLBI terminal, operator	yangwj
Hua Zhang			zhangh
Jun Ma		receiver	majun
Shiqiang Wang		antenna	wangsbq
Chenyu Chen			cbency
Guanghui Li		network, computer	ligh
Xiangfeng Wang			wangxf

Nanshan Station is very important for the domestic Chinese VLBI network, but also for the IVS and the EVN. How many experiments do you conduct each year?

We conduct about 5–10 VLBI experiments per year for the IVS and about 30 experiments for the EVN. We run a few domestic VLBI experiments per year. During the Chinese lunar mission, we usually have about two days of VLBI experiments per week; these observations have high priority. In addition, we have single-dish observations of pulsars, AGN, and astronomical lines, among others.

What kind of VLBI equipment do you have at your station? What is your e-VLBI status?

We have receivers at 0.3/0.6 GHz, 1.6 GHz, 2.3/8.4 GHz, 5 GHz, and 22 GHz (under construction). The VLBI record-



Yes, definitely, we participate in the Chinese lunar missions. We are now preparing for the next lunar mission, probably to be launched at the end of the year. We are also involved in the project 'Chinese continent and environment monitoring network', which makes use of VLBI and GPS.

(left) Urumqi Observatory of the National Astronomical Observatories of CAS is located at the foothills of the Tianshan mountain range. Within the IVS the site is also known as Nanshan VLBI Station. (below) The 25-m, modified Cassegrain radio telescope of Urumqi Observatory was built in 1993.

ers are the American Mark 5 (A, B, and B+) and the Japanese K5; actually the Mark 5B is used right now for most VLBI experiments. The K5 terminal was occasionally used for the Japanese lunar project. A DBBC device from Shanghai was installed at the station to be used in domestic VLBI experiments. For the International Year of Astronomy 2009, Nanshan Station successfully participated in e-VLBI demonstration experiments at 512 Mbps organized by the EVN. After that we stopped because of the high cost of the wideband Internet.

Are you involved in science? What type of scientific investigations do you conduct at the station and/or in collaboration with research groups from universities or other institutions?

I am involved in VLBI astrophysics. With the EVN observations we study the early phase of extragalactic radio sources, e.g. compact/young radio sources. Single dish observations of AGN were initiated in 2005 to search for radio sources which have rapid variability either caused by interstellar scintillation or by the source itself. There are several research groups in the observatory in the fields of pulsar, AGN, and molecular lines research, to name a few. We have close collaborations with, for instance, the pulsar group in Australia and the AGN group at MPIfR Bonn, Germany.

How important is the International VLBI Service for your duties?

The IVS is important for understanding the VLBI performance of the telescope, which takes an important role in the monitoring of the Eurasian plate. We are also interested in the study of astro-geodynamical science, by using the IVS products.

Do you have discussions about the VLBI2010 vision and its possible implementation at your station?

Not yet. I heard that VLBI people at Shanghai Observatory have a plan for the implementation of the VLBI2010 vision. We are currently focused on a new 80-m diameter radio telescope to be built in the area about 70 km southwest of Nanshan Station. It may be usable as an IVS station in the future.

China has a number of very ambitious goals for the near future. Space activities and VLBI play an important role. Do you participate with your radio telescope in the ongoing and upcoming Chinese lunar missions?



Do you have some personal wishes for the future?

I wish to have more collaboration in the fields of high performance IVS observations, IVS data reduction, and IVS sciences with the IVS community. Visiting to our observatory is warmly welcome.

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

ivs-news@ivscc.gsfc.nasa.gov.

The editors reserve the right to edit contributions. The deadline for contributions is one month before the publication date.

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The newsletter is published in color with live

links on the IVS web site at

<http://ivscc.gsfc.nasa.gov/>.

GM2010 – Or How Did the IVS Do in Hobart?

– Lucia Plank and Hana Spicakova (TU Vienna)

When the VLBI community gathered for its General Meeting on the fifth continent, it was only natural to meet



(above) Hana Spicakova and Lucia Plank in front of the new 12-m antenna at Hobart. (below) The Governor of Tasmania, the Honourable Peter Underwood AC, during the dedication ceremony.



one or the other familiar face already at Sydney airport. Glad to escape the snow at home and the rain in mainland Australia, we were welcomed by warm and sunny weather in Tasmania and a first glance of Mt. Pleasant's radio telescopes before landing in Hobart. Hence we immediately forgot the stress and strain of the long travel. Once arrived, people went to their accommodation, either staying at the Wrest Point Hotel and

Casino or on campus at the University Apartments. With the latter came the gamble on the type and price of the morning coffee in the campus cafeteria, the advantage of a daily workout up-and-down the hill, and the occasional bump into a wallaby. Staying at the University Apartments gave some of our “senior colleagues” the feeling of having traveled back in time (quote: “I feel like a student again!”).

On Sunday morning, some of us followed the invitation to stretch our legs by the local host John Dickey, who led a beautiful hike up Mt. Nelson and taught us everything about bush care. At the same time we got a (first and red) picture of the power of the sun in the southern hemisphere.

The official start of the 6th IVS General Meeting was set with the registration and a successful icebreaker recep-

tion on Sunday afternoon. All of a sudden you saw the faces behind the names and brains ran hot when trying to associate authors of published papers with real people. We got a full view of all about 100 participants when entering the big lecture room of the School of Mathematics and Physics of the University of Tasmania for the first time on Monday morning. After the opening words by the Dean of the Faculty of Science, Engineering and Technology, Prof. Margaret Britz, and the IVS Chair, Prof. Harald Schuh, the program could start with the first session. Soon everybody got used to the course of the meeting, and with time and a mind full of sessions, chairs, posters, and talks the magic words “coffee break” gained more and more appeal. Once also the WLAN was set up (Windows users were kindly offered half a day lead), the conditions for an effective meeting could not have been better prepared by the organizing committee. As usual, the program of the GM covered every aspect of our beloved Very Long Baseline Interferometry: the contributions successfully gave the audience more insight into VLBI, brought people up-to-date, discussed current troubles, and gave many ideas for future work.

A clear highlight of the week was the official dedication of the 12-m AuScope antenna at Hobart station, the world's first VLBI2010-type telescope, by none less than the Governor of Tasmania himself. The attendance of His Excellency, The Honourable Peter Underwood, and his wife was a memorable event and quite exciting—not only for our hosts. Followed by a reception in the Grote Reber Museum and a presentation of the other instruments at Mt. Pleasant (such as the 26-m and 14-m antennas) by the courageous Master of Ceremonies, Jim Lovell, it was throughout a successful afternoon.

The day, however, was not done yet. After a quick change of vehicle, we once more crossed the Derwent River on the impressive Tasman Bridge, this time heading towards Bonorong Wildlife Park. Here injured and needy animals learn to survive in the wild on their own again. Before they are released people like us get the chance to take a closer look at them. As far as I understood (and understanding the Tassie accent is not always easy), the Tasmanian devil is one of the most peaceful animals on Earth, all that koalas need to be happy is a tree to sit on and sleep all day, and kangaroos prefer to be called ‘Roos’. Soon the park's inhabitants had everybody spellbound and even the toughest among us could not resist having a picture with the cuddly koala. At this point, it is a good moment to mention the meeting's catering team, which did not forget about us even at the zoo, serving delicious meat skewers and burgers! And just for the record: kangaroos really carry their babies in the pouch—my absolute favorite!

Wednesday, the last day of the GM's main part, culminated in an atmospheric banquet. But before reporting on

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this, let me arbitrarily quote some key phrases out of given talks:

- VLBI2010 has become reality. Now we have to spend our thoughts on the initial operating modus and find solutions for the technical realization of the planned observation strategies.
- Source structure. The variation of our targets through time and frequency will not be negligible for future precision requirements.
- Things started to move concerning the development and advancement of software. Various talks were given on this topic, as well as about new data structure.
- Information about recent projects and missions conveyed an insight into the fascinating scope of space VLBI.

But back to the dinner. After the memorable bus driver telling Australian jokes the day before, today two red double-decker busses were waiting for us. Every bus trip in Tasmania offered a new adventure, starting with the search for the correct bus stop on the right (or left?) side of the street. At Barilla Bay Restaurant we enjoyed Tasmanian cuisine accompanied by songs performed by the national IVS choirs. Star of the night was clearly Bill Petrachenko, who convinced the audience with his courageous solo (Respect!).



(top left) View from Mt. Nelson during the Sunday morning hike, where John Dickey explained everything about bush care. (top right) John Dickey makes a logistical announcement during the meeting. (bottom left) The cuddly koala bear at Bonorong Wildlife Park was everyone's photo favorite. (bottom right) Participants of the meeting board the red double-decker busses in order to be driven to Barilla Bay Restaurant for the conference dinner.

With slightly less participants than the days before, the Joint VLBI2010 and Analysis Workshop on Thursday was not the least bit less successful. Following the statements and given remarks, as well as one or the other heated discussion, once more one could get an insight into the huge complexity necessary for our technique. A fact that I am sure Alan Whitney is more than aware of. In his public lecture "Creating a Radio Telescope the Diameter of the Earth" he touched on many aspects of VLBI system using some very nice approaches, when presenting VLBI to a quite big audience.

Progress of the IVS Directing Board meeting and the mini-TOW Workshop on Friday and Saturday is beyond my knowledge, but I am sure important things were discussed and the community will benefit from their work.

At this point I end my report about the 6th IVS General Meeting as seen from the point of view of a fascinated VLBI freshman, who really enjoyed the week on the Island of Inspiration. Special thanks to all seniors for their open and sincere welcoming of us beginners! I am looking forward to seeing you and (as lively presented by the future hosts) many sights in Madrid in two years when coming together for the 7th IVS GM in February/March 2012!

VLBI and GNSS Meet SKA

— *Sergei Gulyaev, AUT; Dirk Behrend, NVI, Inc./NASA GSFC; Harald Schub, TU Vienna*

On 15 February 2010, following the IVS General Meeting and its splinter meetings, the IVS

in collaboration with the International GNSS Service (IGS) and Auckland University of Technology (AUT) organized the workshop “VLBI and GNSS: New Zealand and Australian Perspectives” in Auckland, New Zealand. This workshop preceded the SKANZ2010 meeting, a conference that brought together leading SKA (Square Kilometer Array) scientists from around the world (115 participants from 15 countries representing 56 institutions; see <http://www.aut.ac.nz/skanz2010>), and allowed for some exchange between the different communities. A strong IVS contingent (roughly 20 people) set sail to the City of Sails, as New Zealand’s largest city is also known, to attend the meeting.

As part of the SKANZ2010 meeting, the local organizers around Patricia Sallis arranged a visit to the radio astronomical observatory near Warkworth on 16 February. Warkworth is a small town about 60 km north of Auckland. The key structure of Warkworth Observatory is the recently erected 12-m radio telescope, which will hopefully show first fringes in an IVS session in a few months. The telescope is part of a proof-of-concept scheme, designed to boost an Australia–New Zealand bid to build the SKA mega-science project (\$4 billion). The bid would see 5,000 dishes built across Australia (Western Australia being the core area) and New Zealand, working as a single virtual super radio telescope with a collecting area of one square kilometer. The SKA is expected to be at least 50 times more sensitive than any radio telescope in existence today, allowing astronomers to look back billions of years, close to the time of the birth of the Universe. The station visit was rounded out by a tasting of “Cosmos Chardonnay 2008” at Ransom Wines, a vineyard only a couple of kilometers away from the observatory.

The full-day workshop covered topics such as the goals and activities of the IVS and IGS, astrometry, combination of VLBI and GNSS for TRF and EOP improvement, VLBI and GNSS activities in New Zealand and Australia, and possible links between the VLBI and GNSS techniques. The attending SKA experts inquired about possible applications of the SKA in the geosciences. This led to the idea of possibly setting up a Task Force to study the potential SKA appli-

Another memorable event of the SKANZ2010 meeting was the conference dinner that was held at Auckland’s famous Sky Tower Observatory restaurant. This type of observatory allows spectacular views of the city of Auckland and beyond from a high vantage point. Its azimuth slew speed, however, hovers around $0^\circ/\text{s}$ —in this respect far inferior to Warkworth Observatory.

We would like to thank AUT for hosting this event and can only congratulate the local organizers on their excellent job.



Participants of the workshop “VLBI and GNSS: New Zealand and Australian Perspectives”.



(left) Participants of the SKANZ2010 meeting at the new 12-m antenna at Warkworth. (center) The “Cosmos Chardonnay 2008” was served at Ransom Wines after visiting Warkworth Observatory. (top right) A view of Auckland harbor with the Sky Tower in the background. (bottom right) A view of Auckland harbor from the Sky Tower Observatory restaurant.

News from the Directing Board

– Dirk Behrend, NVI, Inc./NASA GSFC

As has been common practice in the past, the IVS Directing Board met in conjunction with the General Meeting in Hobart for a full-day meeting. In order to be able to discuss items that would come to light during the GM, the 23rd Board meeting was scheduled for the end of the GM week. An additional advantage of this setup was that guests (e.g., leads of working groups) could be invited to give a report about their activities in person. With all these logistical items perfectly in place, the stage was set for another successful meeting. Only meeting fatigue at the end of a long event could hamper the success. But the very comfortable environment of the University of Tasmania made sure that this did not happen.



Leonid Gurvits presents the work of WG5 on Space Science Applications to the IVS Directing Board.

The reports and discussions covered all aspects of geodetic/as-trometric VLBI from co-ordination, station items, and analysis to technology development and VLBI2010. In the following I give a summary of items that are likely to be of common interest.

New components. It is with great pleasure that we are able to welcome Parkes as new network station in the IVS family. ATNF/CSIRO submitted a proposal for becoming a network station prior to the General Meeting and the Board approved the proposal. This “doubles” the number of IVS stations in Australia to two. But with the AuScope antennas in Yarragadee (Western Australia) and Katherine (Northern Territory) coming up probably later this year, we will see a significant increase in IVS stations down under. Shortly after the GM, the Geographical Survey Institute (GSI), Japan submitted a proposal to also become an Analysis Center in the IVS. The Board unanimously approved the proposal. We are very thankful to GSI to take on this extra task and welcome them as Operational Analysis Center.

Intensive sessions. The groups at Onsala and Tsukuba have demonstrated ultra-rapid dUT1 results for Intensive experiments (on the baseline On-Ts). The use of this capability should propagate into the regular dUT1 product provision. In order to look into this matter and to revisit the current Intensive setup, the Board created a Task Force on Intensive Sessions. The task force consists of Rüdiger Haas (chair), Dirk Behrend, Kerry Kingham, Brian Luzum, Axel Nothnagel, and Kazuhiro Takashima. It is anticipated to have a corresponding proposal ready by the next Board meeting in October.

VLBI Data Structure. The chair of WG4 on VLBI Data Structures, John Gipson, reported that the work of the WG is coming to an end. It is planned to publish a short written report and a full description of the new data format. Both should be available as a final draft at the Board meeting in October 2010. The target is to introduce the new format in spring 2011 and then have an overlap between the new and old formats for about half a year. Goddard is working on a new analysis package (“new solve”), which supports the new format. Work is in progress to implement the format also in other packages, such as VieVS at TU Vienna.

Space Science Applications. The WG5 on Space Science Applications, which was formed in March 2009 and is co-chaired by Leonid Gurvits and Patrick Charlot, is tasked with the investigation of synergies in scientific and technological areas between the IVS core activities and VLBI experiments in application to planetary and space science missions.

Work has begun on a ‘white paper’ in October 2009 covering the goals, scientific applications (planetary and non-planetary), targets (e.g., Mercury, Mars, deep space astrophysical missions), specific technologies (hardware, software), and activities. It is foreseen to have an advanced draft ready by the October 2010 Board meeting.

Upcoming Meetings...

EGU General Assembly 2010 Vienna, Austria May 2-7, 2010	IAG Commission 1 Symposium Marne-La-Vallée, France Oct. 4-8, 2010
Meeting of the Americas (AGU) Foz do Iguassu, Brazil Aug. 8-13, 2010	GGOS/IAU Workshop Shanghai, China Oct. 25-28, 2010
Journées 2010 Paris, France Sep. 20-22, 2010	AGU Fall Meeting San Francisco, USA Dec. 13-17, 2010

<http://ivscc.gsfc.nasa.gov/meetings>

The next Board meeting will be held in Shanghai, China on 23 October 2010.

Recent and Future GGOS Activities

– Dirk Behrend, NVI, Inc./NASA GSFC



In February 2010 the Global Geodetic Observing System (GGOS) was able to fill the open function of the Coordination Office (CO). The proposal of the Agenzia Spaziale Italiana / Centro di Geodesia Spaziale (ASI/CGS) in Matera, Italy was approved by the GGOS Executive Committee. The CO consists of Dr. Giuseppe Bianco (head), Dr. Doreen Hagemeister (secretary), Dr. Cecilia Sciarretta and Dr. Vincenza Luceri (technical and scientific advisors). The CO commenced work with starting collaboration with BKG, the host of the GGOS Portal, on porting the GGOS Web pages. A new e-mail address for the Coordination Office was established with ggos_co@asi.it. Another structural change was the resignation of Hans-Peter Plag from the position as co-chair and all official functions within GGOS. GGOS is thus led by the chair, Markus Rothacher, and one co-chair, Ruth Neilan.

The GGOS Intergovernmental Committee (GIC) had its second meeting in Miami, FL in February 2010.

It had a wider agency representation than the initial meeting in Frankfurt, Germany in November 2009. The meeting was chaired by Prof. Grünreich of BKG and focused on a white paper and the future steps. The white paper will be carried over to a call for participation that will be distributed to government agencies worldwide. The ultimate goal of the GIC is to ensure long-term funding for geodetic infrastructure. Further meetings of the GIC are planned for the FIG International Congress in Sydney, Australia (11–16 April 2010) and the EGU General Assembly 2010 in Vienna, Austria (2–7 May 2010).

The GGOS Science Panel members and other interested scientists will meet for a science workshop in Shanghai, China about “Observing and Understanding Earth Rotation” to be held from 25–28 October 2010. More information will be posted online at <http://ggos-c19.shao.ac.cn/> and distributed through e-mail exploder lists.

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