



Oleg Titov, one of two IVS Associate Members in Australia, sits in a eucalyptus tree at the top of a hill outside Canberra.

New IVS Member: Geoscience Australia

In 2001 Geoscience Australia (formerly AUSLIG) applied for membership in IVS by proposing to sponsor an IVS Analysis Center. The Directing Board accepted the application on July 9, 2001, after e-mail discussions. We interviewed Dr. Oleg Titov, project officer in Geoscience's Space Geodetic Analysis Center, about the plans for participation in the IVS. Oleg recently moved to Australia to join GA as their VLBI expert. He was previously at St. Petersburg University in Russia.

Q: Oleg, what are the interests of Geoscience Australia to join IVS, and what plans do you have for the IVS Analysis Center?

A: As we understand the importance of VLBI for geodesy and its key role for astrometry we like to participate in the processing of geodetic and astrometric data. We are going to contribute daily EOPs from R1 and R4 VLBI sessions. In the long term, we want to make contributions to ITRF and ICRF.

Q: What is your own role within Geoscience Australia?

A: Officially I am working half-time for Geoscience and half-time at the Australian National University (ANU) as a visiting fellow in Prof. Kurt Lambeck's group. My field there is geodetic applications of VLBI (plate tectonics, station velocities, etc.). At Geoscience, I am in the Space Geodetic Analysis Center (SGAC) directed by Dr. Ramesh Govind. SGAC is part of the Geodesy Department managed by John Manning. That's the chain of my bosses. In the SGAC there are a total of five scientists working on analysis of GPS, SLR, DORIS, gravimetry and VLBI data for all the services (IGS, ILRS, IDS and IVS). We also support an on-line GPS service for users of high-accuracy coordinates and we process GPS data at tide gauges for sea level monitoring. I am cooperating with Australian astronomers by participating in VLBI source imaging programs under the ATNF umbrella (with HartRAO and Kokee) as an operator at the Parkes telescope.

Q: Processing data requires also the production of VLBI data. What are the current commitments of Australian telescopes to the IVS?

A: At the moment the Hobart telescope (operated by University of Tasmania) continues its regular observations. Geoscience Australia supports the Hobart

station. The University of Tasmania and GA have now been successful in obtaining an Australian Research Council (ARC) grant to undertake VLBI observations for the next 5 years. Through the ARC funding to upgrade from Mark III to Mark5 has also been secured. The contract is under consideration now. I was told that the all formal papers will be signed soon. I hope after that Ramesh Govind and I will visit Hobart to discuss more technical details—amount of observation per year, IVS membership for Hobart, etc.

Q: Finally, how do you like living in Australia? How does your family find it? Have you taken any excursions within Australia?

A: The life here is pretty good. My family finds Australia to be too warm but it is very good especially for children. We have already visited Sydney, Pacific coast, Parkes telescope. Unfortunately, I have no driver license yet, so we are not too mobile. I am going to complete my driving course in May and to buy a car after that. Then we can see the country.

— interview by H. Hase and N. Vandenberg

Global e-VLBI Workshop at MIT Haystack Observatory

—Alan Whitney, MIT Haystack Observatory
LOC Chairman

A two-day workshop on the electronic transmission of VLBI data (dubbed "e-VLBI") will be held 8-9 April at MIT Haystack Observatory, jointly sponsored by IVS, GVVWG and Haystack Observatory.

With the world increasingly wired for high-speed data communications, the prospects for routine global e-VLBI become brighter every day. The meeting at Haystack Observatory is being organized to explore the current state of high-speed astronomy data transmission, concentrating on e-VLBI, but recognizing the synergy with other geodesy/astronomy applications requiring real-time or near-real-time high-speed data transmissions.

Key networking specialists and providers will present their views and projections for meeting the challenges presented by e-VLBI.

The meeting will be attended by 70 people, representing institutions from all over the world. For more info go to:

<http://web.haystack.mit.edu/e-vlbi/meeting.html>.



IVS General Meeting Held During Japanese Risshun

—Nancy Vandenberg, NVI Inc./GSFC

—Tetsuro Kondo, CRL

—Kazuhiro Takashima, GSI



Members of the LOC in the final preparation stages on Saturday afternoon. Left to right: Yoshihiro Fukuzaki, Tetsuro Kondo, Kazuhiro Takashima, and Junko Nishino.



At the icebreaker reception, Hiroyuki Nakagawa demonstrates correct scare technique for Setsubun.

welcomed the participants with the lofty theme that VLBI is a symbol of international harmony. Wolfgang Schlüter, IVS Chair, welcomed everyone to the meeting. Following a short remembrance by Chuck Naudet of JPL, the participants

Markus Rothacker asks a question during the sessions. On his right is Harald Schuh. In the background, left to right, Yoshiaki Tamura, Hans-Georg Scherneck, Axel Nothnagel, Ojars Sovers, and Yasuhiro Koyama.



The second IVS General Meeting in Tsukuba, Japan, officially began at the icebreaker reception on Sunday evening, February 3. In Japan this day is called Setsubun, the day between the winter and spring, or Risshun, seasons when it is traditional to throw soybeans at evil spirits to drive them out. Soybeans and evil spirit masks were provided to the attendees at the reception so we could all participate in the ritual.

On the first day of the meeting, participants were welcomed by representatives of the agencies sponsoring the meeting. The opening session was chaired by Fujinobu Takahashi, CRL, Chair of the Local Organizing Committee. Toshiki Aoyama, Vice Minister for Engineering Affairs of the Ministry of Land, Infrastructure and Transport, and Takashi Iida, President of CRL,

observed a moment of silence in honor of colleague George Resch who recently passed away.

Papers were presented in six technical/scientific sessions, Monday through Wednesday

morning, beginning with the keynote presentations on VLBI, precise and consistent for decades. Keynote presentations included an overview of the Integrated Global Geodetic Observing System (IGGOS) project by Hermann Drewes, a presentation of the essential role of VLBI in astrometry by Nicole Capitaine, and a discussion of combination of results from different techniques by the IERS Analysis Coordinator, Markus Rothacker. In the second session Harald Schuh presented the report of the IVS Working Group 2 on IVS Product Specification and Observing Programs. The station and correlator session was highlighted by presentations about the installation of TIGO in Chile and the plans for the Korea VLBI Network. The technology session focused on disc-based systems and high data rate and e-VLBI developments. The modeling session had papers about tides, source structure, and atmosphere treatments as highlights. In the final technical session there were presentations on results from VLBI geodetic analysis, EOP and nutation series analysis, tropospheric and ionospheric parameter determination, the future of the ICRF, and the design of the SELENE mission. At the closing session, Wayne Cannon invited everyone to attend the next General



Maria Kudriashova explains her poster to Christian Bizouard.

Continued on next page

Mis-adventures of the LOC....

After the banquet, the leftover sake in its barrel was taken by the LOC in their car to the Epochal conference center. Although the car was driven slowly so that the barrel would not tip over, some sake was spilled anyway. After that there was a strong smell of sake in the LOC's car for several days. If the car had been stopped by a policeman, the smell would have been enough to give the driver a ticket even if he was not drinking himself! It is suspected that the leftover sake was effectively consumed at GSI, and that the extra masu (wooden sake drinking cups) were taken to CRL where they are also used effectively.

-Tetsuro "I love sake very much" Kondo

NEWS

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Tetsuro Kondo shows off his plaque of appreciation for serving on the IVS Directing Board 1999-2001.

Meeting which is planned to be held in Ottawa, Canada in 2004. Also at this session Wolfgang Schlüter presented Tetsuro Kondo with a plaque of appreciation for his service on the IVS Directing Board during its first two years.

Participants were treated to an exquisitely prepared buffet banquet on Tuesday evening at the Sansuitei restaurant. A traditional wooden barrel of sake was broken by hatchets wielded by representatives of GSI, CRL, IVS, and the host of the next General Meeting. The sake was served in square wooden cups called masu. Everyone enjoyed the extraordinary array of sushi, sashimi, tempura, etc., as well as unlimited amounts of sake, beer, and wine.

Wednesday afternoon a "mini-TOW" (Technical Operations Workshop) was held at Tsukuba. All day Thursday, participants went on an excursion to visit GSI headquarters, the Tsukuba antenna, the Kashima Shrine, and the Kashima telescopes. On Friday the Analysis Workshop brought together analysts for discussions on VLBI additions to the SINEX definition, presentation of a new exchange file format, and analysis pilot project results. The IERS Analysis Coordinator attended the workshop and provided insight from the other services. A full set of pictures is available on the IVS web site at <http://ivscc.gsfc.nasa.gov/meetings/gm2002/>, click on "Pictures".



Alan Whitney and Bruce Schupler contemplate their next selection from the banquet buffet. Next to them are Hans-Peter Plag and Dan MacMillan.



Wayne Cannon, Wolfgang Schlüter, Yoshihisa Hoshino (GSI Director General), and Yasuyoshi Sakai (CRL Vice President) follow the tradition of "kagamibiraki" or "breaking the mirror" to open the sake barrel. A "kagami" (mirror in English) means a round rice cake and "biraki" (open in English) means to break. A long time ago, in the samurai days, there was a custom of breaking and eating big round rice cakes for good health in the coming year. The lid of a sake barrel is also called "kagami" (mirror), so opening the lid is also called "kagamibiraki". Sake has been offered as a religious libation from ancient times, and so the custom has developed that drinking sake will bring answered prayers, health and happiness in a new venture. Opening the lid of the sake barrel with wooden hammers is performed at banquets and on founding anniversaries so it was appropriate to open the sake barrel on the occasion of the third anniversary of IVS.



Fuji Takabashi serves sake to Calvin Klatt, and the Japanese waitress in traditional dress serves Kerry Kingham. In the background, Nancy Vandenberg and Cynthia Thomas wait their turn.



Bill Petrachenko, Arthur Niell, Nicole Capitaine, Rizwan Mamat and Brian Corey stop to talk inside the Kashima Shrine.



Mikio Tobita explains how the GSI mobile antenna operates while Yoshihiro Fukuzaki holds the map. Watching are Ojars Sovers, Kenichiro Takabei and Nicole Capitaine. The GSI headquarters buildings are in the background.

Publications Available

Copies of the 2001 Annual Report and the 2002 General Meeting Proceedings will be mailed to each IVS Associate Member. Extra copies are available on request to the IVS Coordinating Center. Send your request to ivscc@ivscc.gsfc.nasa.gov. We have plenty of copies available.

Upcoming Meetings..

Global e-VLBI Workshop
Haystack Observatory
Apr. 8-9, 2002

Mini-Mark 5 Workshop
Haystack Observatory
Apr. 10, 2002

IERS Workshop -
Implementation of the
new IAU resolutions
Apr. 18-19, 2002
Paris, France

European Geophysical
Society
Apr. 21-26, 2002
Nice, France

OCCAM User Workshop
IGG of TU Wien,
Apr. 28-30, 2002
Vienna, Austria

Spring AGU
May 28 - June 1, 2002
Washington, D.C.

About the 7th Directing Board Meeting held in Tsukuba, February 3, 2002

—Wolfgang Schlüter, BKG

The IVS Directing Board held its 7th meeting February 3, 2002 in conjunction with the General Meeting in Tsukuba, Japan. The important items are summarized in this newsletter article. The full report is available on the IVS web site.

Data Analysis. Six Analysis Centers are providing regular submissions for the generation of the IVS products “Earth Orientation Parameters”. IVS acknowledges the contributions of USNO, which starts again in 2002. A proposal made by Harald Schuh (University of Vienna) on the derivation of tropospheric parameters from the regular weekly observations (IVS “R” sessions) was discussed. The estimates of the parameters are comparable to GPS solutions and will yield an independent series for comparisons and verification. It was proposed to set up a “Pilot Project” (comparable to the establishment of Working Groups: charter, schedule, members, and chair) leading to a new IVS product.

Network. Statistics of station performance show that station data losses are more than 11%. RFI is a significant contributor to data loss. The upgrade of some network stations still gives some concerns. Through close coordination of the available resources of the IVS components, some of the stations still employing a MkIII system might be upgraded to Mk4. The Board supports a plan to keep the network data quality as high as possible. Improvements in the overall observing scenario will occur with the available seven S2 Data Acquisition Systems build in Canada and also with the planned K4 Intensive type sessions of Wettzell-Germany (FSG) and Tsukuba-Japan (GSI).

Technology Developments. The work for the VLBI Standard Interface (VSI) is going on in both hard- and software development. The Mk5 systems, which will replace the Mk4 data recorder is reaching the level for field tests. Two systems will be deployed to Kokee Park and Wettzell and two systems at the Haystack correlator, using the daily Intensives

as test sessions. The Mk5 system will support data submission via Internet. The Board expressed its strong support for the development of e-VLBI.

Working Group 1. WG1 (Mapping phase center of GPS transmission antennae) investigated the feasibility of VLBI to determine the GPS antenna phase centers, estimated the error



Attendees at the IVS Directing Board meeting listen intently to the IVS Chair's report. Left to right: Brian Corey (attending as IVS Working Group 1 chair), board members Shigeru Matsuzaka, Axel Nothmangel, Wayne Cannon, Alan Whitney.

budget and proposed an experiment employing the VLBA. The main error sources are the reference source positions (L-band), the ionosphere, the atmosphere and instrumental errors which in sum make the goal very difficult to accomplish. The final report of the WG is in preparation. The working group (WG1) has been closed. Thanks to the WG members and especially to Brian Corey, chair.

Working Group 2 and Program Committee. WG2 (Review of products and related observing programs) has presented its final report, and the results were adopted into the IVS observing program starting in 2002. The program requires 20-30% more resources for 2002 and 2003, which were gained by improved international collaboration. A lot of work has been done by the WG members. Thanks to all of them, in particular Harald Schuh, chair of WG2. The Board decided to change the status of the Interim Program Committee, which has strongly supported IVS goals and established the appropriate observing program, from interim to permanent with the same members.

IAG structure and IGGOS. The IAG structure, the statutes and by-laws have changed. The new ones will take effect in 2003. The Board voted to approve its participation as an IAG service and abide by the new structure. IGGOS (International Global Geodetic Observing System) which aims for a reference frame, precise and consistent for decades, is a serious candidate for an IAG project in which VLBI will play a fundamental role.

A Taste of History....

22 Years Ago....

The first version of the Field System was used in 1980 to control the Mark III equipment at the Green Bank 140-ft telescope. The Field System ran on an HP1000M machine that had a 2 Mbyte capacity removable disk that was about the size and shape of a large hubcap. There was also an 8-inch floppy disk (250 kb capacity) for transferring log files. How things have changed!

Feeling nostalgic? Send your “taste of history” contributions to ivs-news@gfsc.nasa.gov. If we use your submission, you will receive a free IVS t-shirt (while supplies last).

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@ivscg.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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VLBI How TO...

Third IVS Analysis Workshop

—Axel Nothnagel, Geodetic Institute of the University of Bonn

On February 8, 2002, the Third IVS Analysis Workshop was held at the Epochal Conference Center, Tsukuba, Japan. The one-day meeting was attended by about 40 participants. Important decisions were made concerning the SINEX extension for VLBI and the Platform Independent VLBI Data Exchange Format (PIVEX).

On the basis of a proposal of the IVS Analysis Coordinator and of inputs from the other space geodetic techniques, the IERS Analysis Coordinator had compiled a proposal for SINEX Version 2.0 which now includes all current VLBI related parameters. SINEX 2.0 also permits the submission of normal equations (or reduced normal equations) with their right hand side column for easy combination with other solutions, both VLBI and other space techniques.

As a result of an extensive discussion at the workshop it was decided by the participants that in the future there will be two types of SINEX submissions on the basis of SINEX 2.0: a) solutions which are described in full by their covariance and constraint matrices and b) reduced normal equations with their complete right hand side column and rank deficiency for the datum definition for the sole purpose of further combination with other solutions. For more details see <http://alpha.fesg.tu-muenchen.de/iers>.

The Platform Independent VLBI Exchange Format (PIVEX) will help to eliminate computer platform dependent data handling problems as they currently exist between the Mark IV analysis software package Calc/Solve and other programs. Following a presentation by A.-M. Gontier during the IVS General Meeting, it was decided to proceed with the necessary activities to implement the tools for PIVEX. Programs will be developed to write PIVEX files from Mark III/IV databases.

It is planned that PIVEX files will be generated by the IVS Operation Centers in parallel to NGS card files when the conversion programs have been tested. As soon as standardized readers are available there will be a grace period for NGS card files for a maximum of six months. After this, NGS card files will not be produced any more.

Where is my VLBI Data?



How to Recognize Recording Problems and Prevent Data Loss

—Rich Strand, Gilmore Creek Geophysical Observatory

The IVS network stations around the world are required to provide consistent recordings to the correlators for the high accuracy needed in preparing VLBI solutions. Until the phase out of the Haystack-Metrum recorder by digital disc drives and other techniques, operators are required to recognize data loss caused by tape recording problems.

Precheck and head calibration. The first basic step in recognizing recorder problems that cause data loss is to understand the recorder precheck and head calibration procedures. Both of these subjects are well documented and classes are available during the IVS Technical Workshops. Having this basic system knowledge allows the experts to help you quickly identify and isolate problems by systematic troubleshooting. The eye pattern oscilloscope is a mandatory piece of test equipment required to perform these two procedures.

Parity errors. The FS parity error report is the guide to determine the quality of recording. During observing sessions the operator must decide what action to take when parity errors do occur. No specific rules have been written to cover each and every situation but general guidelines have evolved over time. Some random sprinkling of low errors can be normal. Often these will vary from tape to tape. Dirty tapes will cause higher than normal errors. If these errors continue to increase the tape should be changed. Errors that creep up on the low or high end of the head tuck often indicate an impending head failure.

Fatal losses. High errors reported by the first parity check after a tape change indicates a problem with the new tape or a piece of the cotton swab is stuck on the head from the cleaning. It's best to lose some scans and re-clean or replace the tape. A high burst of errors that does not repeat may have been something that passed through the heads. Problems that cause the \$ error on all tracks could be that the read head didn't converge or the inch worm controller failed. The first parity check of a session that reports no data recorded may indicate the recorder's FS setup procedure is in error.

Verify a clean head or good tape if the \$ error is consistent for a single track or more. Continue recording unless you have a recorder with multiple head stacks which allows other options for recording. Unless verified as a read problem, the \$ error on all tracks, all the time is a fatal error and the session should stop for recorder repair.

References. For additional review, the 1998 VLBI Operations Workshop handbook has a collection of papers written by recording experts on tape recorder pretests, head calibration, tape handling and shipping. This guide will point you to the resources necessary for quality recording in the field to prevent data loss.

News Update: TIGO Arrived in Concepcion

—Hayo Hase, BKG



The TIGO platform as of February 2002. The building in the rear is the newly-built TIGO headquarters.

On January 11, 2001, the seven 40-ft containers with the world's first transportable fundamental station for geodesy, called TIGO, arrived at its destination in Chile. It was late afternoon when the ship CCNI Angol arrived at Puerto Lirquen near Concepcion. The unloading action was well planned and very carefully executed, since the containers had been equipped with accelerometers in order to prevent destruction due to inadequate handling.

On the following day the containers were transported accompanied by police from the harbor to the campus of the Universidad de Concepcion, and from there via "Camino Einstein", an unpaved road with an inclination of 16%, the last and most critical path of its journey. The containers were unloaded manually and successfully.

During installation of the radio telescope in early February a moment of truth occurred when the telescope was mounted on the platform which had been constructed during 2001. It was a big relief to see that the construction allowed the installation with no problem. Besides the VLBI part a lot of other equipment was installed: laser telescope, meteorological sensors, solar panels, batteries, internet access.

The working conditions for the TIGO team, consisting of three relocated Wettzell staff and 11 Chileans, improved significantly with the opening of the small TIGO headquarters with facilities like toilets and a meeting room.

Testing of the VLBI antenna will be made during March; first experiments are scheduled for April 2002.



TIGO containers leaving the harbour Puerto Lirquen.

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