

# The International GNSS Service (IGS): An IAG Service that Delivers

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**Biennial IGS Analysis Workshop,  
Olsztyn, Poland, 23-27 July 2012**

Chris Rizos, [c.rizos@unsw.edu.au](mailto:c.rizos@unsw.edu.au)



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## **The International GNSS Service (IGS): *An IAG Service that Delivers***

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The workshop was hosted by the University of Warmia & Mazury (<http://www.uwm.edu.pl>), at its campus on the outskirts of the town of Olsztyn, approximately 200km north of Warsaw, the capital city of Poland. The head of the LOC was Prof. Andrzej Krankowski, the chair of the IGS Ionosphere Working Group. There were approximately 230 registered participants from many parts of the world, most from IGS entities, but also a significant number representing geodesy and high precision positioning users.

The IGS is a service of the International Association of Geodesy (IAG), which produces a range of “products” for precise positioning users and geodesists; including RINEX data files from over 400 global reference stations, advanced products such as precise satellite orbit and clock corrections for GPS and GLONASS, timing, SINEX files for the ITRF computations, and ionosphere and troposphere delay models – see <http://igs.org/components/compindex.html>. All the work is undertaken by Analysis Centres (ACs) or Working Groups (WGs). The IGS was officially launched 1 January 1994.

The IGS Workshop was organised with morning plenary sessions from Monday till Friday, and poster sessions and three parallel “splinter” group meetings on each of the afternoons Monday to Thursday. What was presented at the plenary sessions was: general status on the progress of IGS activities; reports on challenges and achievements associated with the different IGS products; and talks by stakeholders and users outside the IGS. (I made a presentation on Tuesday in my capacity as President of the IAG.) The titles of the plenary sessions were:

*Monday 23<sup>rd</sup> July*

- Welcome
- M-GEX Campaign
- Network Infrastructure and Real-Time

*Tuesday 24<sup>th</sup> July*

- IGS and the Geodetic & Wider Community
- Multi-GNSS

*Wednesday 25<sup>th</sup> July*

- Modelling Observations & Station Motion
- Atmospheric Delay Modelling & Applications

*Thursday 26<sup>th</sup> July*

- Space Vehicle Dynamics & Attitude, Clock Modelling & Time Scale Realisations
- Antenna Calibration Modelling & Errors

*Friday 27<sup>th</sup> July*

- Geodetic Applications of IGS Products
- Splinter Working Group Reports

The poster sessions were devoted more to topics of interest to users, as well as technical details of advances being made by ACs and WGs.

In many respects the real “analysis workshop” was done in the splinter sessions, where ACs and WGs exchanged information, debated technical issues, and drafted plans and recommendations on how the IGS products would be improved, as well as proposing new products. The groups that met were: Infrastructure Committee, Data Center WG, Real-Time

WG, GNSS WG, Bias & Calibration WG, Ionosphere WG, Troposphere WG, Antenna WG, Clock Product WG, Space Vehicle Orbit Dynamics WG, Reference Frame WG, RINEX WG, Tide Gauge WG, and AC Coordinator. In every respect, despite challenges, the IGS groups have delivered ever improving products, and will continue to do so into the future. Several new initiatives were launched. Notable outcomes include:

- Success of the M-GEX (Multi-GNSS Experiment), with a global tracking network of about 55 stations. In addition analyses of the data collected so far were presented. (Though there has been no access to BeiDou data outside of China.) Issues concerning uncalibrated antennas and shortcomings in the RINEX format were identified.
- Progress in generating and disseminating real-time GPS orbit and clock products by the Real-Time Pilot Project was surprising. There are many ACs, and many of the technical issues have been sufficiently well addressed that a Real-Time Service (RTS) will be launched before the end of this year. That is referred to as Initial Operational Capability (IOC). Then GLONASS and other products (e.g. ionospheric delay maps) will be produced from 2013. (For details of RTPP progress, see June 2012 “GPS World” article at <http://www.nxtbook.com/nxtbooks/questex/gps0612/index.php#/48>.)
- The new IGS Site Guidelines are close to being finalized. (Announcement soon.)
- Most ACs will start “re-processing” all of the IGS archived data using the latest models and reference frame in 2013, a campaign known as REPRO2. The new SINEX files will then contribute to the new ITRF2013 to be released in 2014.
- The IGS is active within RTCM SC104, and promoting several new message types, including RTCM HP-MSM and RTCM SSR messages, needed for RTS and for Precise Point Positioning (PPP) users.
- The IGS reaffirmed its commitment to transition to the new RINEX 3.0x format, suitable for multi-GNSS constellation measurement data, as quickly as possible. (The biggest obstacles are the ACs themselves, still only geared up to handle GPS and GLONASS data.)

The only possibly discordant note regarding the workshop, and of the IGS in general, is that the IGS continues to work independently of the GNSS receiver manufacturers. No manufacturer representatives attended the workshop. Yet discussions regarding M-GEX, RTS, RINEX and RTCM would benefit from the input and feedback of manufacturers.

In addition to the IGS Workshop, meetings were held by WG-A “Compatibility & Interoperability” of the UNOOSA’s International Committee on GNSS (ICG) – see <http://www.unoosa.org/oosa/en/SAP/gnss/icg.html>). The IGS and IAG are associate members of the ICG, and co-chair with the FIG WG-D “Reference Frames, Timing & Applications”. Hence the IGS plays an important role within the ICG. The M-GEX campaign is strongly endorsed by the ICG, and may be considered as an “embryonic” global multi-GNSS network that could serve the role of the proposed International GNSS Monitoring & Assessment Service (iGMAS). China presented very advanced plans for iGMAS, that caught everyone by surprise. Their proposal to “engage” with the IGS, but to nevertheless deploy a separate network, analysis and product dissemination capability, did not resonate. No doubt there will be a renewed push for iGMAS by China at the November meeting of the ICG in Beijing. The IGS will endeavour to influence the direction such an initiative may take, because the IGS will be generating many of the identified multi-GNSS products by late 2013.

The IGS Governing Board (GB), of which I have been a member since 2004, met on the afternoon of Sunday 22<sup>nd</sup> July, and after the close of the workshop on the afternoon of Friday 27<sup>th</sup> July. (The IGS GB meets twice a year, and its Executive holds regular teleconferences.)

The GB meeting received reports from the ACs and WGs, and made several decisions. The ones of most interest were:

- The IGS appointed Dr Oliver Montenbruck to chair the GNSS WG – Prof Robert Weber stepped down after many years as chair. The GNSS WG is responsible for running the M-GEX campaign, and to encourage interest by the IGS ACs to commence experimenting with GNSS data apart from the GPS and GLONASS systems.
- The IGS approved the extension of the M-GEX campaign till the end of 2013, with clear goals that by that time M-GEX stations would be merged with the current IGS tracking network, and that there would be as much analysis (and generation of products) as possible. Acquisition and analysis of QZSS, Galileo and BeiDou tracking data is to be a high priority.
- The IGS approved a tentative start to the RTS from November 2012, subject to several conditions being met. This would be an IOC service to encourage sophisticated GPS users (those with their own PPP software) to experiment with the products. It is recognised that adoption of RTS orbit and clock products into GNSS receiver firmware to support PPP by general users will take some time. The generation of GLONASS orbit and clock product within the RTS is expected to begin some time in 2013.

In summary, the 2012 IGS Workshop was well organised and everything ran very smoothly. The papers, together with video recordings of the presentations, will be placed on the IGS web site in the coming weeks.

The IGS ACs are doing a fantastic job (visit <http://acc.igs.org/> to get an impression of the behind-the-scenes work done by the ACs, under the leadership of the AC Coordinator). The M-GEX and RTS are two outstanding successes that will lift the visibility of the IGS even further. The level of expertise within the IGS is truly staggering, and is a good sign for international and national geodesy. Although Australia plays a vital role by hosting IGS tracking stations, there are no IGS ACs in Australia. Other Australians who attended this workshop were Gary Johnston (GA, and a member of the IGS GB), Grant Hausler (Uni Melbourne), Joel Haasdyk (LPI), and Kefei Zhang (RMIT). The next IGS workshop will take place in 2014, in its 20<sup>th</sup> anniversary year, and will likely be hosted by the USA.

**C. Rizos**  
**30 July 2012**