The IGS:
a First Class IAG Service

Chris Rizos

President, IAG

Member, IGS Governing Board

International Association of Geodesy

A Constituent Association of the IUGG

... advancing geodesy ...

IAG Services

IERS: International Earth Rotation and Reference Systems Service
(ILS in 1899, BIH in 1912, IPMS in 1962, IERS in 1987)

Geometry

- IGS: International GNSS Service *(1994)*
- IVS: International VLBI Service *(1999)*
- ILRS: International Laser Ranging Service *(1998)*
- IDS: International DORIS Service *(2003)*

IGFS: International Gravity Field Service *(2004)*

Gravimetry

- BGI: Bureau Gravimetrique International *(1951)*
- IGeS: International Geoid Service *(1992)*
- ICET: International Centre for Earth Tides *(1956)*
- ICGEM: International Centre for Global Earth Models *(2003)*

Ocean

- IDEMS: International Digital Elevation Models Service *(1999)*
- PSMSL: Permanent Service for Mean Sea Level *(1933)*
- IAS: International Altimetry Service *(2008)*

Std

- BIPM: Bureau International des Poids et Mesures *(Time 1875)*
- ~~IBS: IAG Bibliographic Service *(1889)*~~

Global Geodetic Observing System

- GGOS promotes the use of Modern Geodesy – technologies, methodologies and infrastructures – to study the System Earth with *unprecedented* spatial and temporal resolution, accuracy and timeliness
- Focuses on the challenges of meas… Earth dynamics, …
- …
- …
- … the IAG's services, to build synoptic geo-monitoring services, develop high-level geodetic products, and to promote the unique capabilities of geodesy

GNSS(technology) and the IGS(service) are critical to delivering on the GGOS vision

Why the IAG is proud of the IGS

Products & Know-how… *delivering high quality products to science & society... unrivalled GNSS expertise... crucial for ITRF & other high-level products*

Global Coverage… *engaging with many agencies & individuals around the world... promoting IAG & GGOS goals & geodetic technologies*

Adaptability & Innovation… *ability to extend & maintain tracking network… experiment & develop new products… with an inbuilt self-improvement mechanism*

Engagement… *scientific, professional & UN organisations… respected "brand"… encouraging an open & inclusive culture across the geodetic community (& beyond)*

IGS

Despite numerous hurdles & challenges...

... Far from "ideal" IGS Tracking Network

... Uneven performance of IGS components

... No direct funding from IGS for ACs, WGs, DCs, Network

... Volunteer service to IGS by many people

... Internal contradictions

... Detractors from inside & outside the IGS

... Continuous improvement of product quality

... Ever increasing expectations of IGS by stakeholders, as well as the wider scientific & GNSS user community

Congratulations…
20 years of service to the IAG, to science & to society...

Entering the 3rd decade of service…
Where-to for the IGS?

IGS's Strategic Goals

- Establish IGS as the world benchmark for GNSS products and services with leading-edge expertise and resources; and the development, integration, and evolution of services and performance to meet user needs
- Ensure that the IGS plays an expert advisory role on GNSS matters through expertise and policy advocacy
- Maintain the highest level of governance of the IGS, and exercise funding development needed to maintain its infrastructure and operation

Seismic shift is imminent*…*

IGS will be expected to go beyond its traditional role as provider/enabler of Precise Positioning for science...

What the IGS offers is unrivalled GNSS expertise & capability...

From GPS(+GLONASS) to Multi-Constellation GNSS

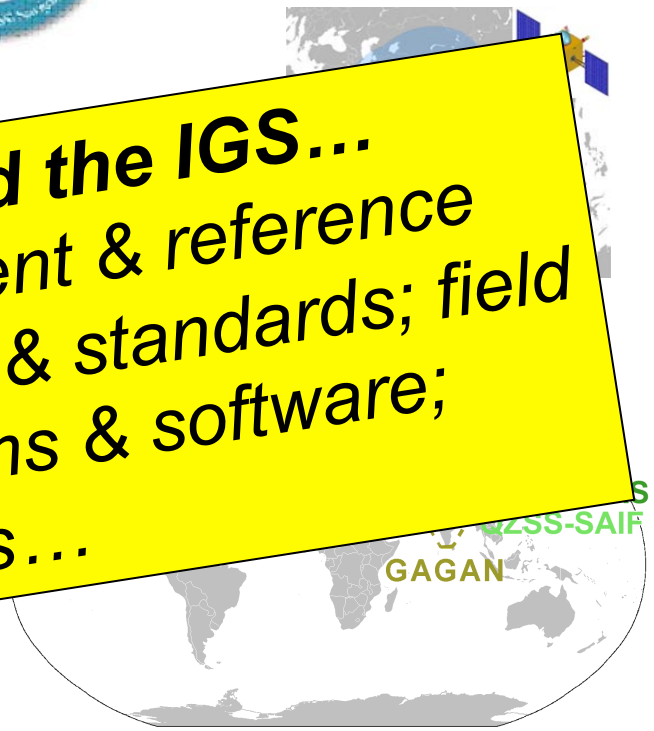
+

GNSS:

GPS (30) *(3…*

Profound impact on users and the IGS…
requiring upgrade of user equipment & reference networks; communications, formats & standards; field techniques; modelling, algorithms & software; products & services…

R… …BCM



QZSS (1) *(5-7)*

IRNSS (2) *(7)*

Number of satellites: (Current) *(Planned)*

IGS MGEX web site... http://igs.org/mgex/

IGS

International GNSS Service
Formerly the International GPS Service

About	Mail	FAQ	Publications	FTP	Site map
	Products	Network	Projects	Calendar	Organization

MGEX

Stations Working Group

Welcome to the Home Page of the IGS Multi-GNSS Experiment!

Scope

The Multi-GNSS Experiment (MGEX) has been set-up by the IGS to track, collate and analyze all available GNSS signals. This includes signals from the BeiDou, Galileo and QZSS systems, as well as from modernized GPS and GLONASS satellites and any space-based augmentation system (SBAS) of interest. Analysis centers will attempt to estimate inter-system calibration biases, compare equipment performance and further develop processing software capable of handling multiple GNSS observation data.

Clone for international access at UNAVCO (http://igsws.unavco.org/mgex/)

Constellation Status

Status information for the various navigation satellite systems can be obtained by clicking on the icons below. Primary attention is given to the emerging constellations that are currently deployed and undergoing initial validation.

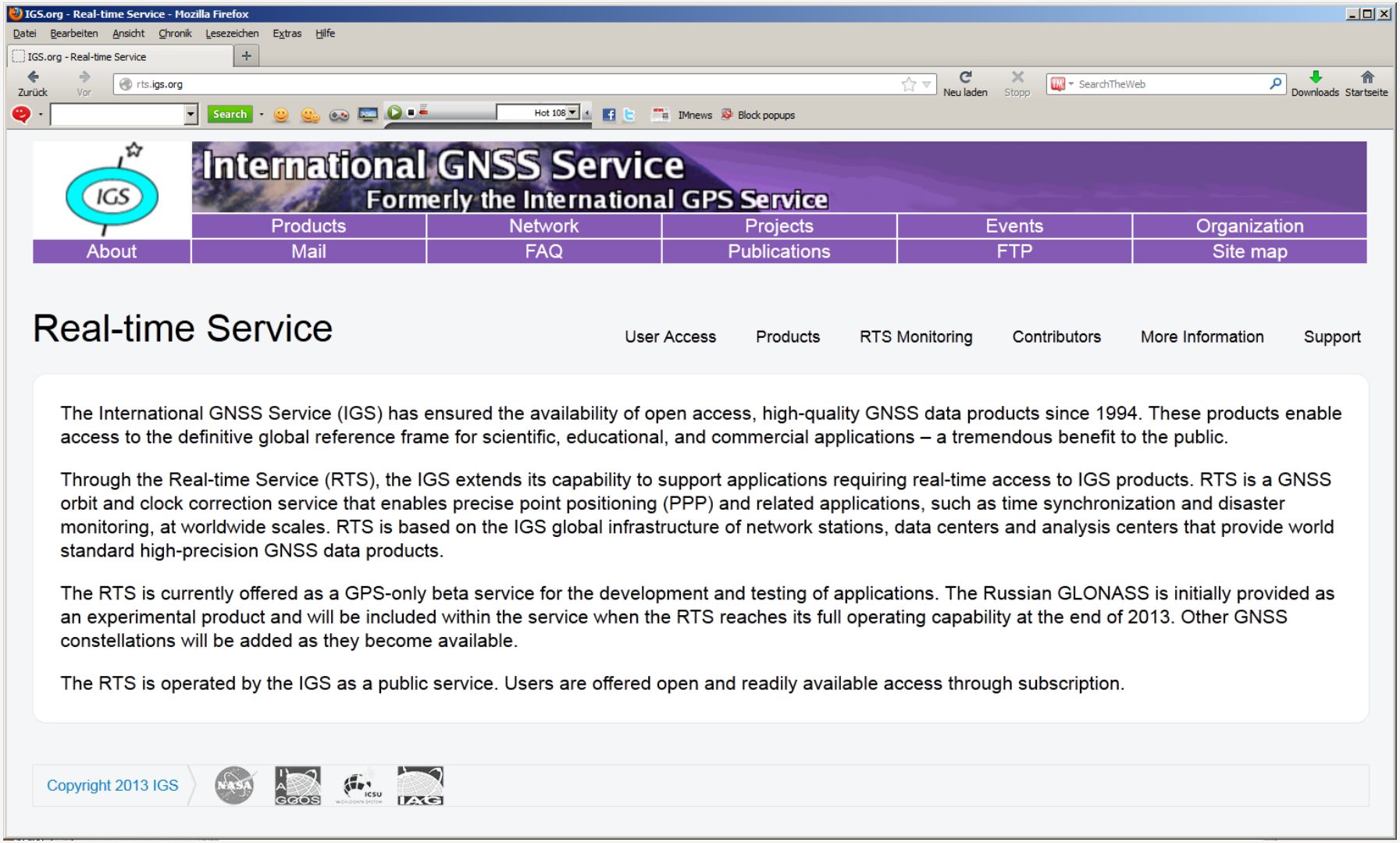
GPS GLONASS Galileo BeiDou QZSS IRNSS SBAS

IGS MGEX Activities...

- Galileo, BeiDou, QZSS test products...*plus GPS, GLONASS*
- Contributing ACs: CNES, ESA, CODE, GFZ, JAXA, TUM, WUM... *more needed!*
- >100 stations in MGEX network... *some real-time*
- Orbits & clocks at decimetre-level accuracy... *SLR residuals*
- Preliminary Inter System Bias results & recommendations
- Approx 2.5yrs RINEX 3.x obs & nav files... ftp://cddis.gsfc.nasa.gov/pub/gps/data/campaign/mgex/
- RTCM3-MSM format streams... http://mgex.igs-ip.net
- Dialogue with system providers, instrument manufacturers, other IGS WGs

IGS Real-Time Tracking Network

IGS RTS web site... http://rts.igs.org/



IGS Real-Time Service (RTS)

- International effort of many contributions
- Maintain & extend real-time infrastructure (data transfer, broadcasting, product generation, combination, quality control, etc)
- Develop necessary data formats & transmission protocols... *RTCM, NTRIP, etc*
- Launched on April 1, 2013
- Currently GPS + experimental GLONASS real-time orbit & clock products... *multi-GNSS?*
- Support scientific & other applications... *more than positioning*
- Open data & open standards policy... *as is the IGS custom*
- Working towards FOC... *pilot project, & ultimately standard service*
- ACs: BKG, CNES, DLR, ESA, GFZ, GMV, NRCan, WUM... *more are needed!*

RTS Products... http://rts.igs.org/products

- IGS01/IGC01 (GPS-only) and IGS02 (GPS-only) streams running on 2 or more servers
- IGS03 (GPS+GLONASS) experimental stream
- RTCM3EPH streams... *SSR messages*
- Reference is ITRF2008/IGb08
- Stream access via BKG NTRIP Client (BNC), RTKLIB, etc
- Register for access (via web site)... *393 users by mid-June 2014*
- Support development of higher-level products
- RTS products:

Stream Name	Description	Ref Point	RTCM Messages	Provider / Solution ID	Bandwidth kbits	Software
IGS01	Orbit/Clock Correction, Singe-Epoch Combination	APC	1059 (5),1060 (5)	258 / 1	1.8/sec	ESA/ESOC
IGC01	Orbit/Clock Correction, Singe-Epoch Combination	CoM	1059 (5),1060 (5)	258 / 9	1.8/sec	ESA/ESOC
IGS02	Orbit/Clock Correction, Kalman Filter Combination	APC	1057 (60), 1058 (10), 1059 (10)	258 / 2	0.6/sec	BKG
IGS03	Orbit/Clock Correction, Kalman Filter Combination	APC	1057(60), 1058(10), 1059(10), 1063(60), 1064(10), 1065(10)	258 / 3	0.8/sec	BKG

APC: Antenna Phase Center CoM: Center of Mass, (not compliant with current RTCM-SSR standard). The figures in brackets next to each RTCM message ID denote the message sample interval in seconds.

The greatest challenge for the IGS is to address the need to expand its network, its partners, its product suite & its capabilities…

without sacrificing those qualities & current capabilities that make the IGS respected and successful…

Can it be done?

Some doubts re expansion of IGS capabilities...

- Some question whether we can squeeze anything more out of the IGS
-
-
- Some believe that the mission of the IGS is becoming too broad, and that we should focus on core scientific priorities

*But the IGS could lose relevance & its unique position as **the** authoritative GNSS service if it does not respond to calls for it to do more...*

Be bold!...

10yrs ago we celebrated achievements, today we must grasp new opportunities...

The IGS going forward...

- As an IAG service, the *performance*, *visibility* and *evolution* of the IGS is of particular interest to the IAG... *the IGS is the best known of the IAG services*
- The IGS and the ITRF are considered (by many) as inextricably linked... *hence it has a fundamental role*
- IGS products support not only GGOS and geoscience, but also many other precise positioning and datum modernisation requirements
- The IGS is centre-stage as far as new GNSS developments are concerned... *such a multi-GNSS deployment & testing, global GNSS monitoring, expansion of CORS services, the RTS, modern data services, and in driving modern geodesy forwards*

The IGS going forward...

- This workshop will provide an update on new GNSS developments, products improvements to support the IGS mission, and new IGS products/services for the future
- Outreach, beyond the workshop participants, is crucial... *what do we want to say to others about where the IGS "is" and where it is "going"?*
- Many national & international organisations & groups welcome an expanded (& more visible) role for the IGS... *let's welcome this*
- Multi-GNSS offers both challenges and opportunities
- IGS leadership, governance & planning must keep pace with the evolution of product quality & expansion of capabilities

The IGS going forward...

- The IGS must pay more than “lip service” to the incorporation of new GNSS signals/measurements into routine operations... *in this respect the IGS is lagging*
- In fact, the complete portfolio of IGS products must also be improved... *but prioritise what needs to be improved*
- The IGS-RTS is a crucial – even revolutionary – development, and has as yet *unforeseen ramifications*
- The global GNSS tracking network is the most international part of the IGS... *it is both the IGS’s strength and a component that requires special attention*
- ***Being timid is not part of the culture of the IGS***

The IGS is encouraged to:

- *improve its current capabilities & products*
- *be creative & open to experimentation*
- *develop new multi-GNSS products & services*
- *engage with the other IAG components*
- *continue to play its critical role within GGOS*
- *support global & regional geoscientific, geodetic & geospatial initiatives*
- *continue its trailblazing role as the most visible (& broadly relevant) of the IAG services*

Thank you