



IGS

The IGS in its 20th Anniversary Year: Update on GNSS Activities Related to MGEX and the Real-Time Service

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IGS



IGS

Workshop 2014

June 23-27

Pasadena, California, USA

Celebrating 20 Years of Service

1994 ★ 2014





IGS Today... <http://igs.org>



- The IGS...
 - is a *voluntary federation* of more than 200 worldwide agencies in over 90 countries...
 - *that pool resources and permanent GNSS station data...*
 - *to generate **precise IGS products***
 - operates on a “best efforts” basis... *although with **considerable redundancy***
- IGS products...
 - are **combinations** of independent results from several ACs
 - generated within a **competitive as well as cooperative IGS culture that underpins continuous improvement in performance**
 - are available **free of charge**
 - are *critical to ITRF definition, maintenance & accessibility; and for many scientific & societal applications*



IGS Products...



- **Core products:**
 - global tracking data (*files & data streams*)
 - GPS and GLONASS orbits (*post-processed & real-time*)
 - core station clocks & coordinates (*contribution to ITRF*)
 - clock corrections for satellites (*post-processed & real-time*)
- **Specialised products:**
 - clock corrections & coordinates for other (non-core) stations
 - Earth rotation parameters
 - global ionosphere maps
 - station troposphere parameters
 - Multi-GNSS experimental products
 - Standards (*site guidelines, RINEX, ANTEX, IONEX, ...*)
 - GNSS systems monitoring (*constellation status, DCB, ...*)

<http://igs.org/components/prods.html>



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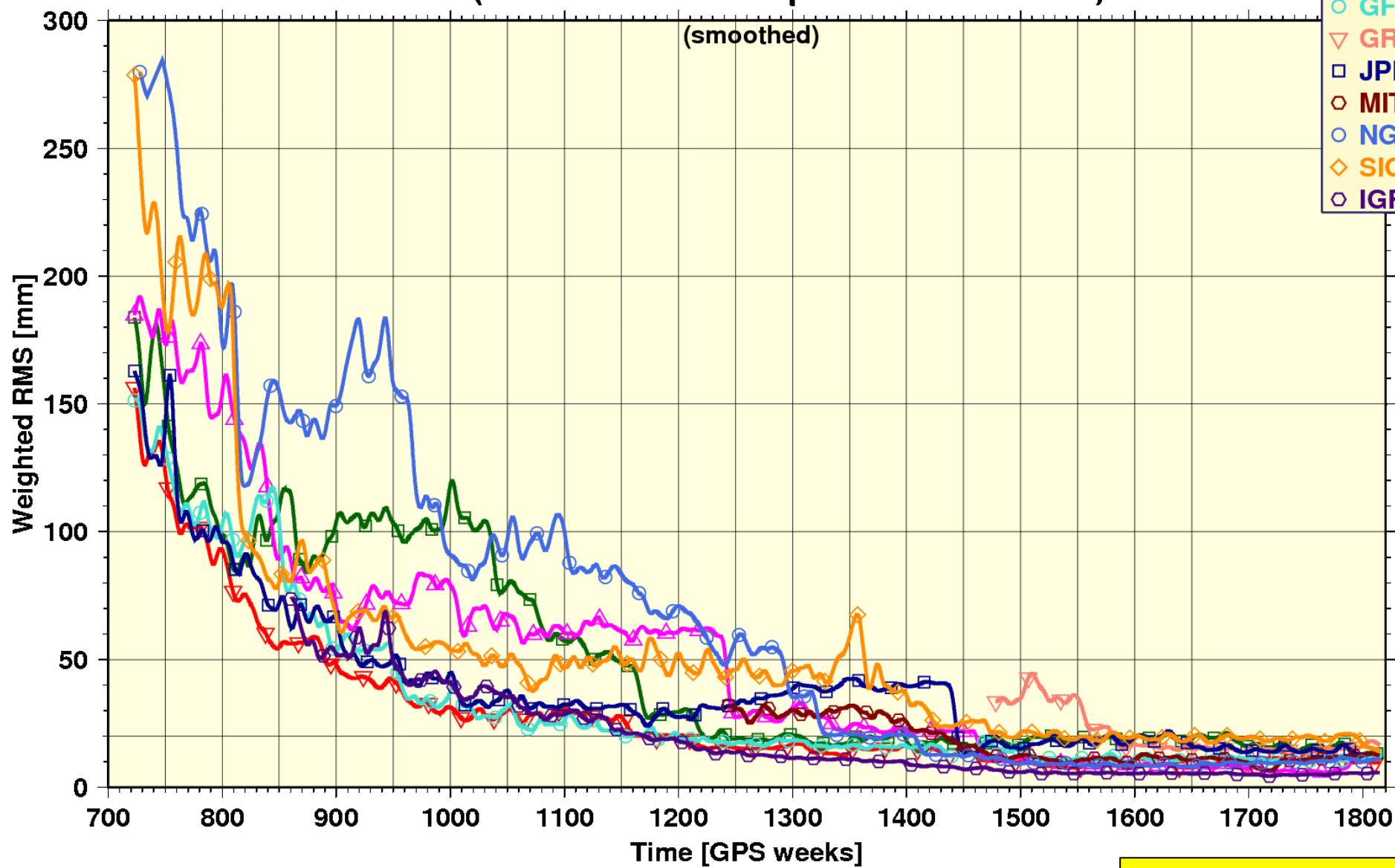
Pasadena, California, USA

Celebrating 20 Years of Service

1994 ☆ 2014

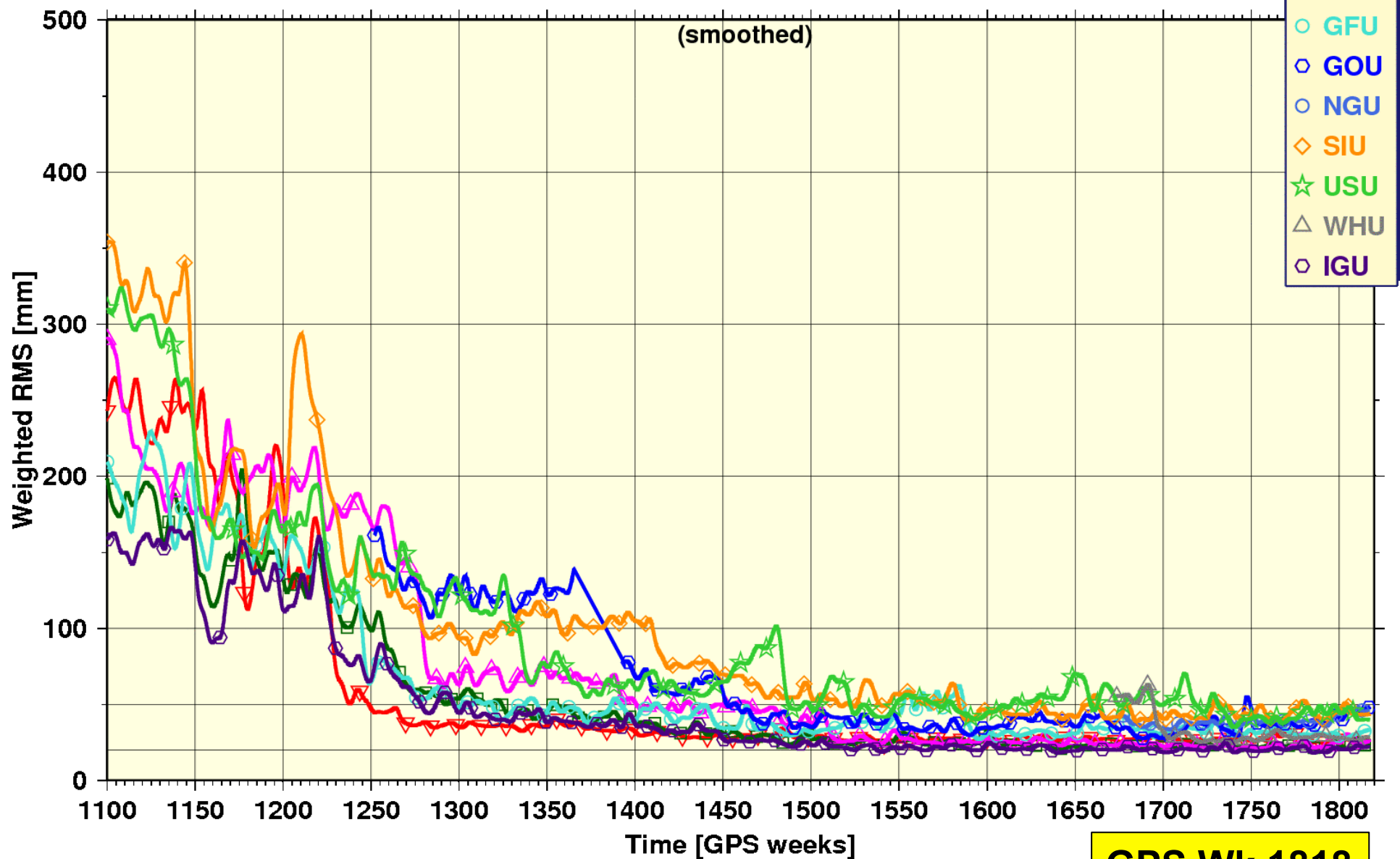
**We celebrated our
achievements...**

Final Orbits (AC solutions compared to IGS Final)



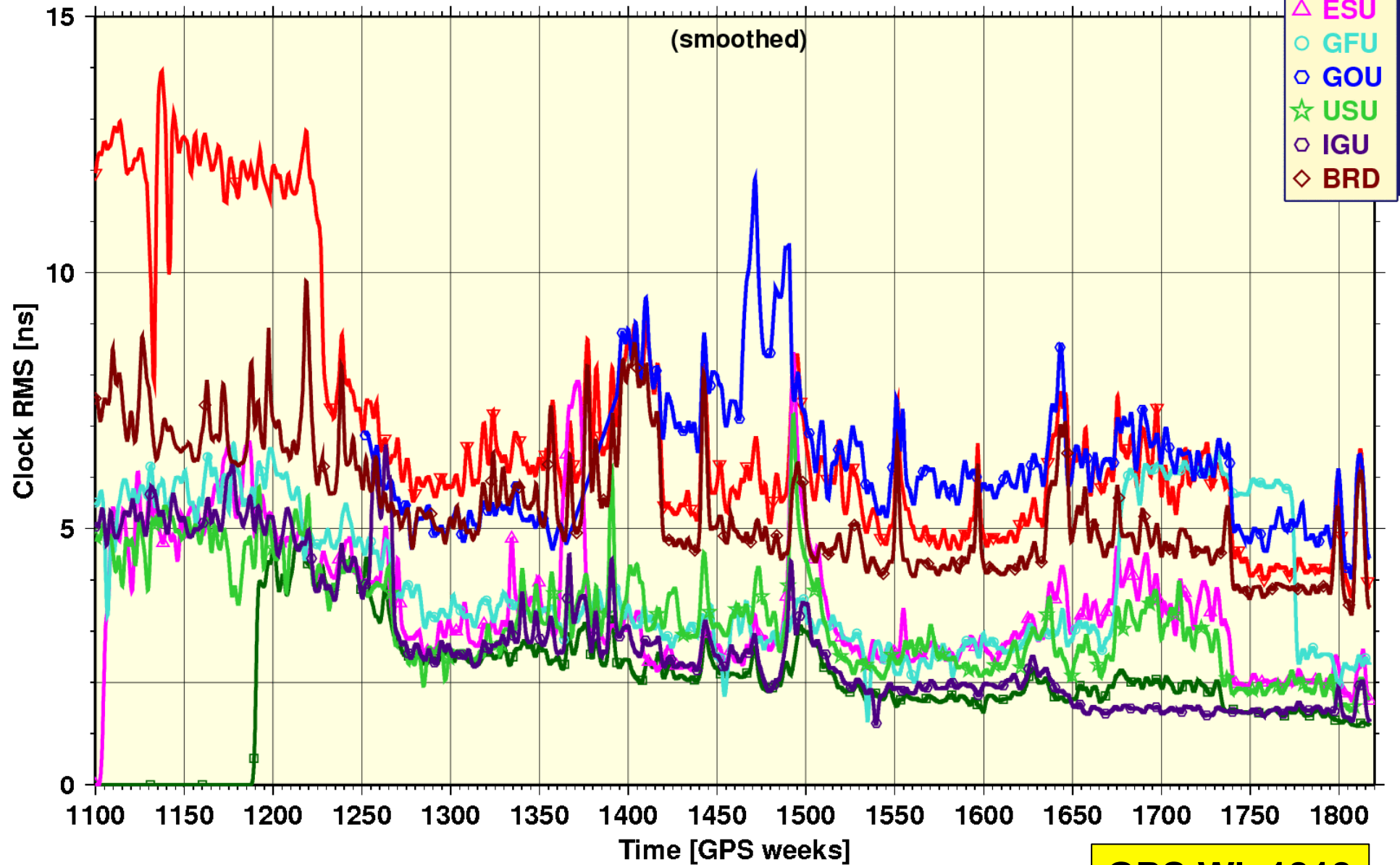
GPS Wk 1818

Ultra Rapid Orbits (RT predictions compared to IGS Rapid)

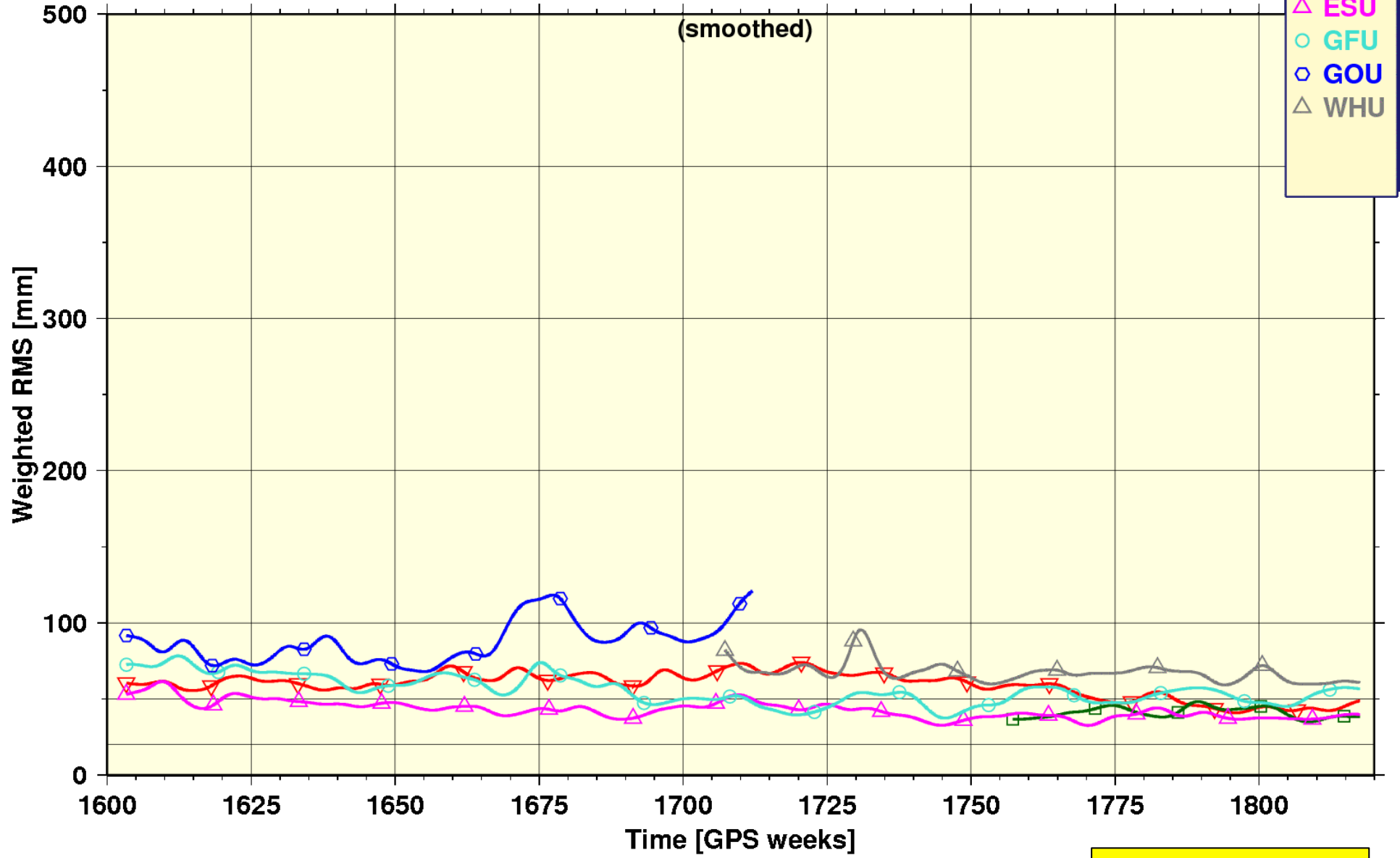


GPS Wk 1818

Ultra Rapid clocks (RT predictions compared to IGS Rapid)



Ultra Rapid Orbits (AC solutions compared to IGS Ultra)



GPS Wk 1818



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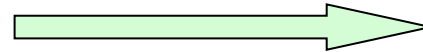
**We are preparing
for the future...**



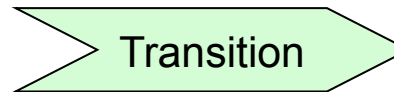
IGS Multi-GNSS & RTS Plan...



High quality GPS/GLONASS network and products



High quality multi-GNSS network and products



- Build-up and share multi-GNSS know-how
- Build-up network and provide access to multi-GNSS data
- Develop prototype multi-GNSS products
- Develop recommendations and standards
- Engage with receiver manufacturers and system providers
- RTS GPS PP

- Merge legacy and multi-GNSS networks
- Achieve interoperability of legacy and multi-GNSS products and services
- RTS GPS+GLONASS

- Incorporate BeiDou, Galileo, and QZSS into standard IGS processing
- Issue combined and quality controlled multi-GNSS IGS orbit, clock and iono products
- Regular multi-GNSS intersystem, interfrequency and intersignal bias estimation
- Link GNSS system times with IGS system time
- Embed new GNSSs into IGS/IAG reference frames
- RTS for multi-GNSS



Drivers of Change...



- IGS is the **International GNSS Service**
 - IGS Strategic Plan foresees extension to multi-GNSS
 - IGS Strategic Plan includes (multi-GNSS) Real-Time Service
 - Well established infrastructure, data & service for GPS + GLONASS
- IGS Strategic Plan foresees extension to multi-GNSS
 - BeiDou, Galileo, QZSS, IRNSS, SBASs

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



Network

Products

Working Groups

Resources

About

MGEX

Data

Products

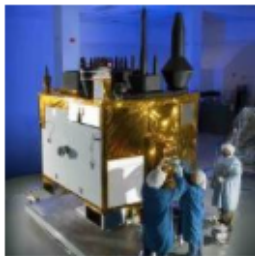
Constellation

Stations

Network

Information

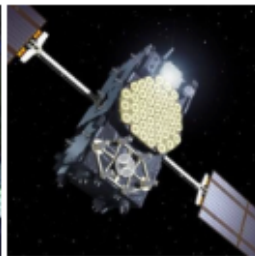
Status information for the various navigation satellite systems can be obtained by clicking on the icons below. Primary attention is given to the emerging constellations that are currently deployed and undergoing initial validation.



GPS



GLONASS



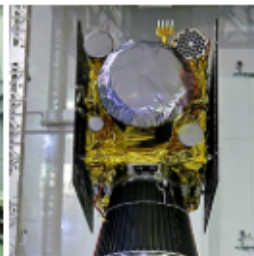
Galileo



BeiDou



QZSS

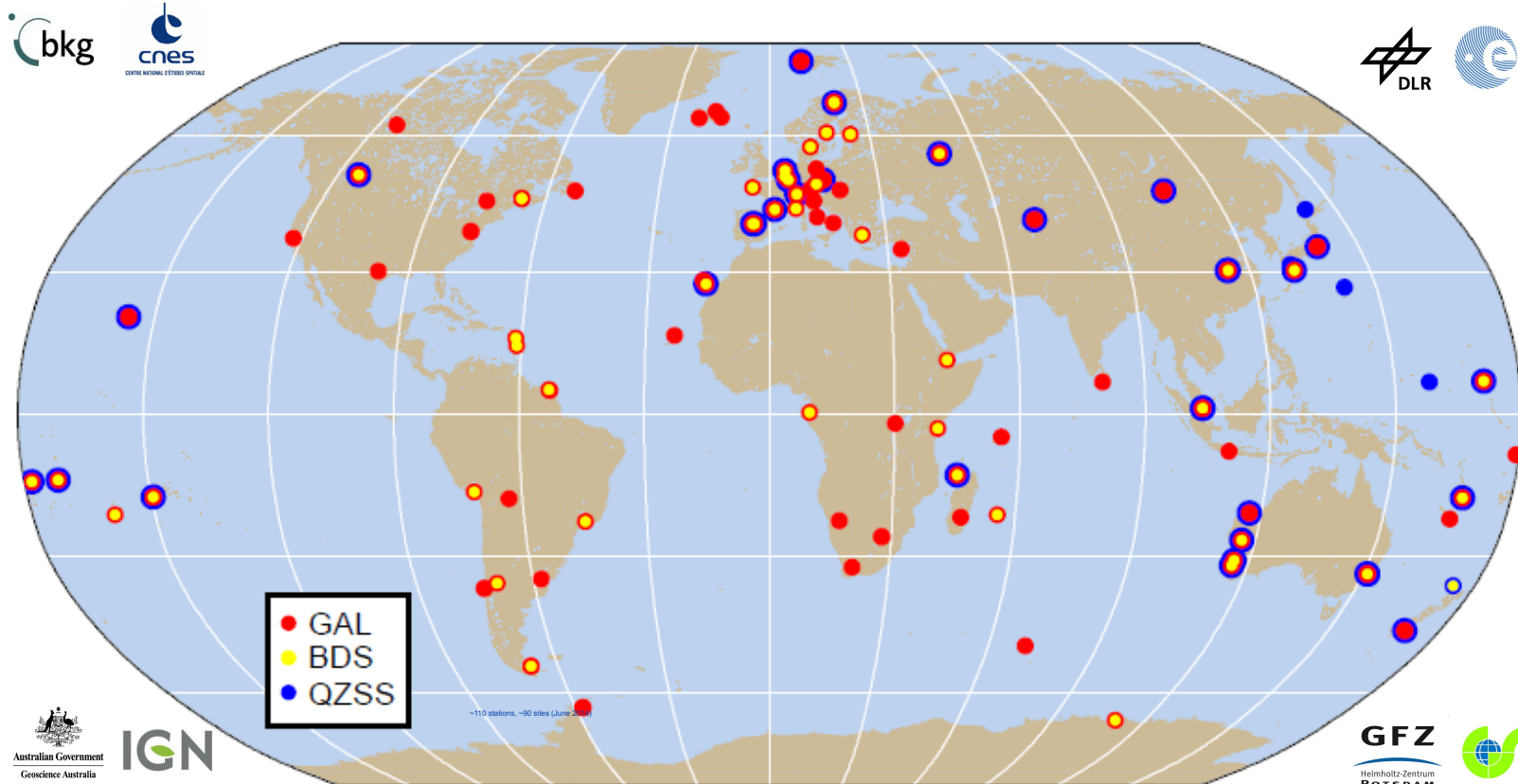


IRNSS



SBAS

IGS MGEX Network...



Archive: <ftp://cddis.gsfc.nasa.gov/pub/gps/data/campaign/mgex/>
Streams: <http://mgex.igs-ip.net>

IGS MGEX Test Products...



<http://igs.org/mgex/#products>

Institution	Products	Constellations	Availability (week/day)
CNES/CLS	grmyyyyd.sp3 GNSS orbits and clocks (15 min)	GAL	since 1692/1
CODE	comyyyyd.sp3 GNSS orbits and clocks (15 min)	GPS+GLO+GAL/GIO	since 1689/5
	comyyyyd.clk GNSS and station clocks (5 min)		
	comyyyyd.bia/dcb Biases	GPS (DCBs) GAL (ISBs)	
	comyyyyd.erp Earth rotation parameters		
GFZ	gfmyyyyd.sp3 GNSS orbits and clocks (15 min)	GPS+GAL	1680/0–1683/0
	gfmyyyyd.clk GNSS and station clocks (5 min)		
	gfmyyyyd.bia Inter-system biases		
	gfbyyyyd.sp3 GNSS orbits and clocks (15 min)	GPS+BDS	since 1777/2– 1781/5
	gfbyyyyd.clk GNSS and station clocks (5 min)		
	gfbyyyy7.erp Earth rotation parameters		
JAXA	qzfyyyyd.sp3 GNSS orbits and clocks (5 min)	GPS+QZS	since 1751/6
TUM	tumyyyyd.sp3 GNSS orbits and clocks (5 min)	GAL+QZS	since 1711/1
Wuhan Univ.	wumyyyyd.sp3 GNSS orbits and clocks (15 min)	BDS	since 1721/2
	wumyyyyd.clk GNSS clocks (15 min)		

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



The screenshot shows the IGS Real-time Service website. The browser window title is "IGS.org - Real-time Service - Mozilla Firefox". The address bar shows "rts.igs.org". The website header features the IGS logo and the text "International GNSS Service Formerly the International GPS Service". Below this is a navigation menu with links: About, Products, Network, Projects, Events, Organization, Mail, FAQ, Publications, FTP, and Site map. The main content area is titled "Real-time Service" and includes a sub-menu with links: User Access, Products, RTS Monitoring, Contributors, More Information, and Support. The main text describes the IGS Real-time Service (RTS) as a public service providing open access to high-quality GNSS data products since 1994. It mentions that the RTS is currently offered as a GPS-only beta service and will include Russian GLONASS and other GNSS constellations as they become available. The footer contains the copyright notice "Copyright 2013 IGS" and logos for NASA, IAGGOS, IGSU, and IAG.

IGS Real-Time Tracking Network...



📍 GPS+GLO 📍 IGPS

150+ stations

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



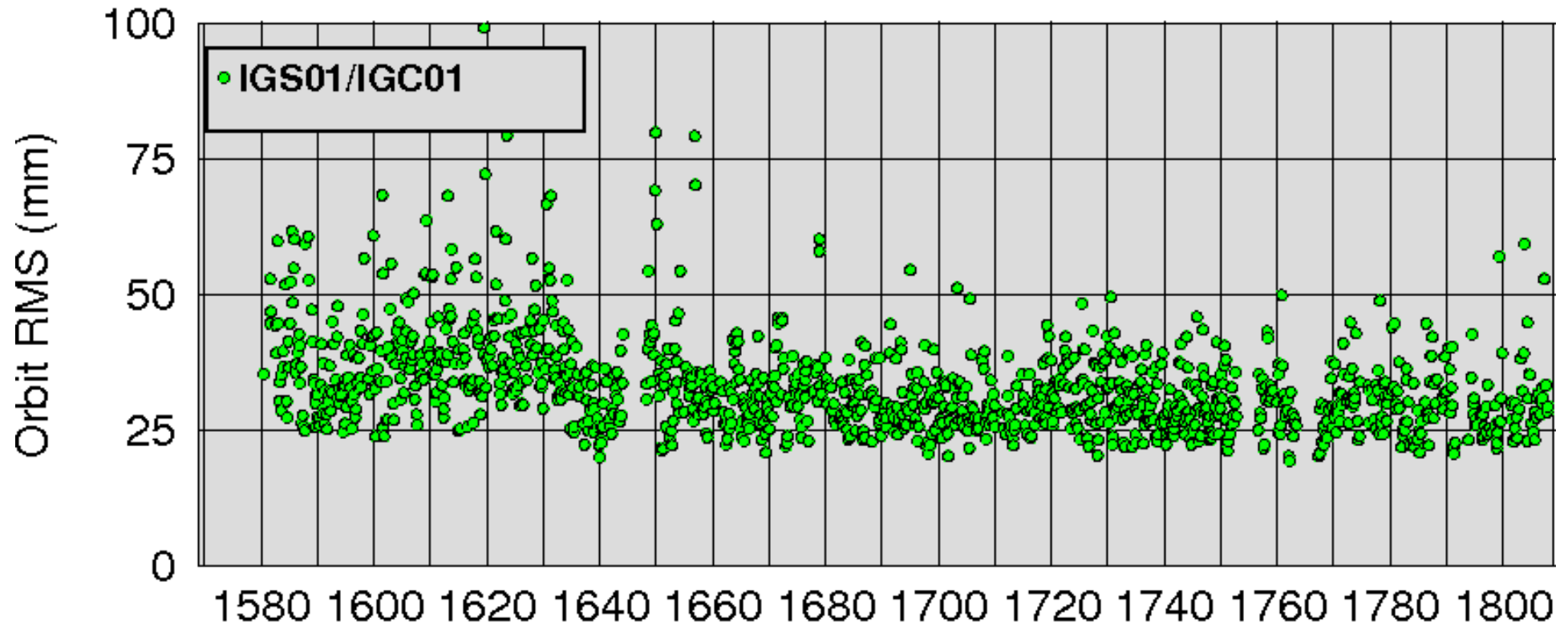
Note:

- **IGS01/IGC01 (GPS-only) and IGS02 (GPS-only) streams**
- **IGS03 (GPS+GLONASS) “experimental” stream**
- **RTCM-SSR message streams**
- **Reference frame is ITRF2008**
- **Stream access via BKG NTRIP Client (BNC) or RTKLIB**
- **Register for user access (via web site)**
- **Products:**

Stream Name	Description	Ref Point	RTCM Messages	Provider / Solution ID	Bandwidth kbits	Software
IGS01	Orbit/Clock Correction, Single-Epoch Combination	APC	1059 (5),1060 (5)	258 / 1	1.8/sec	ESA/ESOC
IGC01	Orbit/Clock Correction, Single-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.

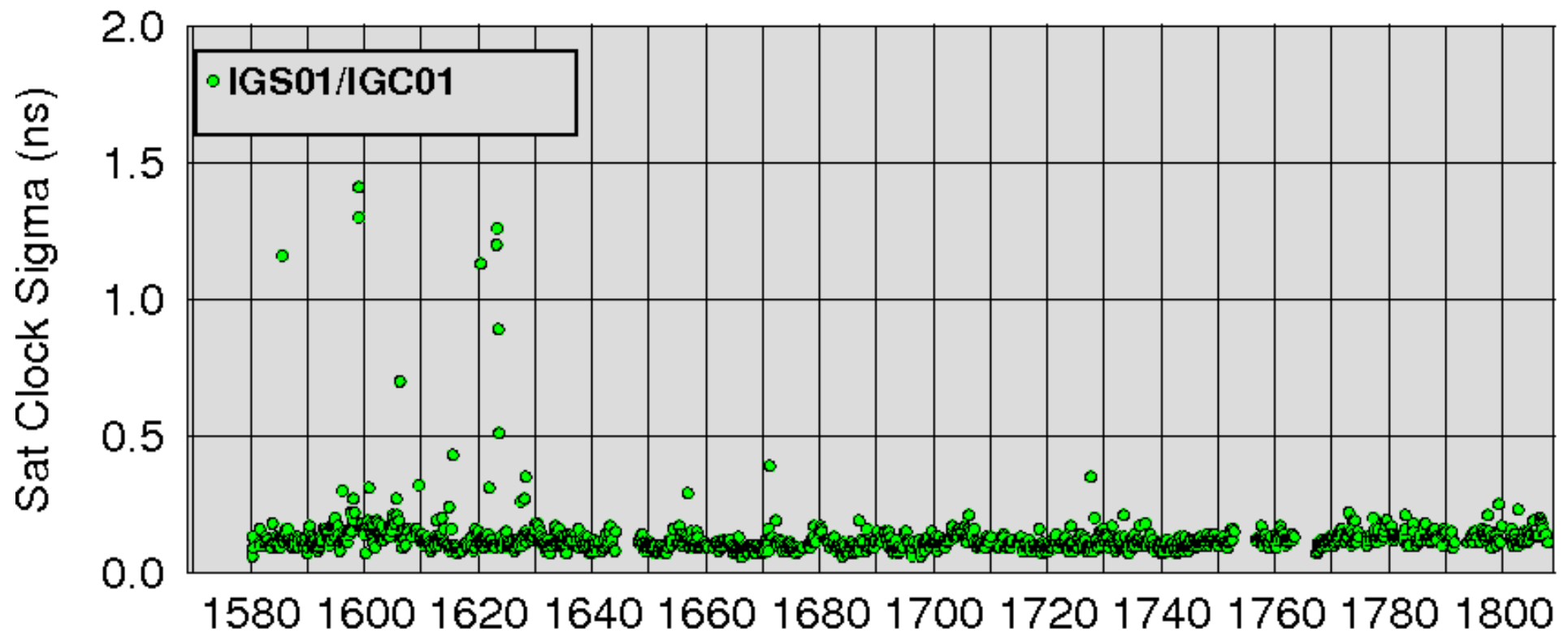
RTS – IGS01/IGC01 Products



<http://www.igs.org/rts/monitor>

GPS week

RTS – IGS01/IGC01 Products



<http://www.igs.org/rts/monitor> GPS week

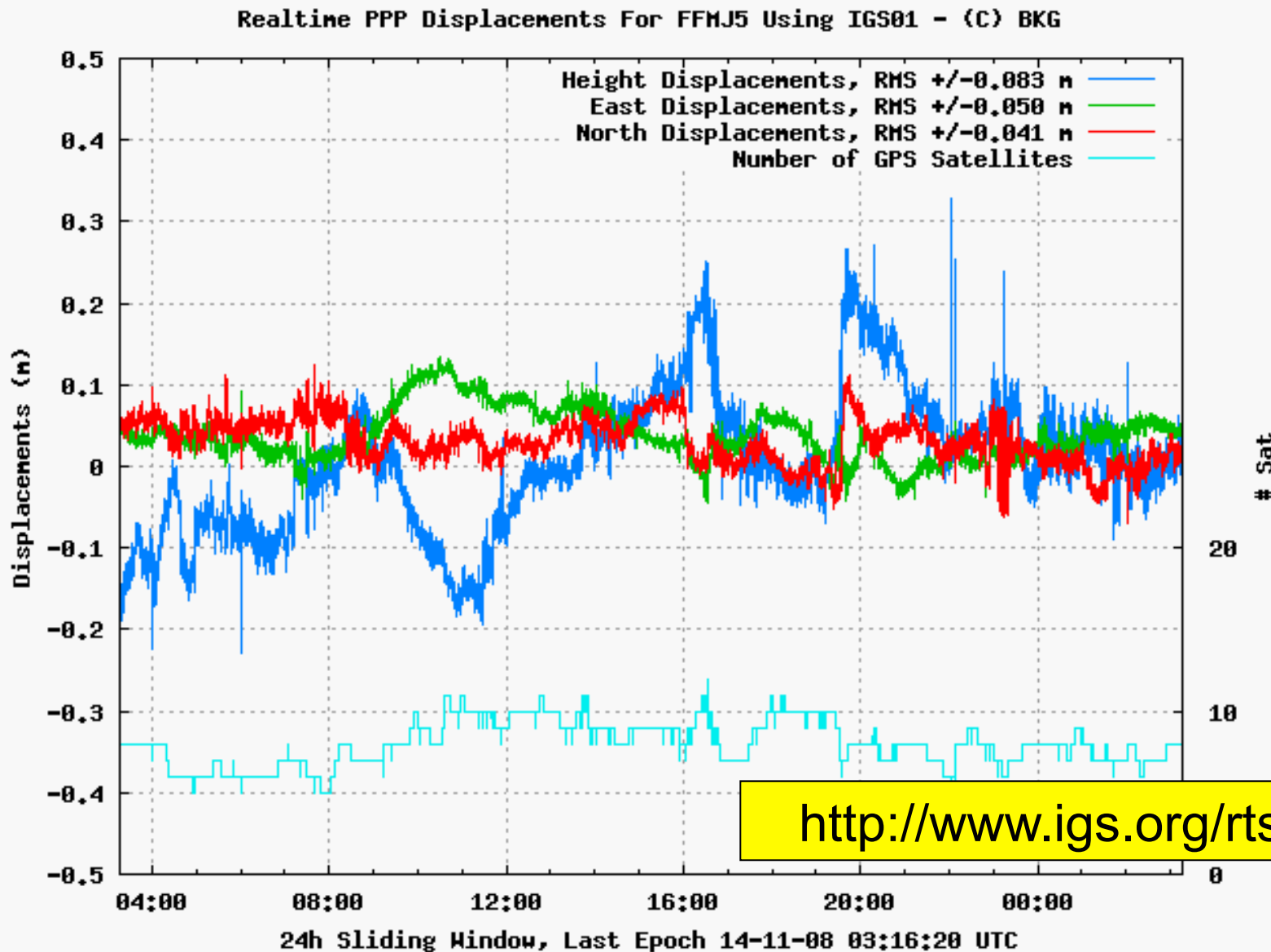
IGS-RTS IGS01...

RT-PPP GPS-only Results



IGS

Frankfurt a.M.

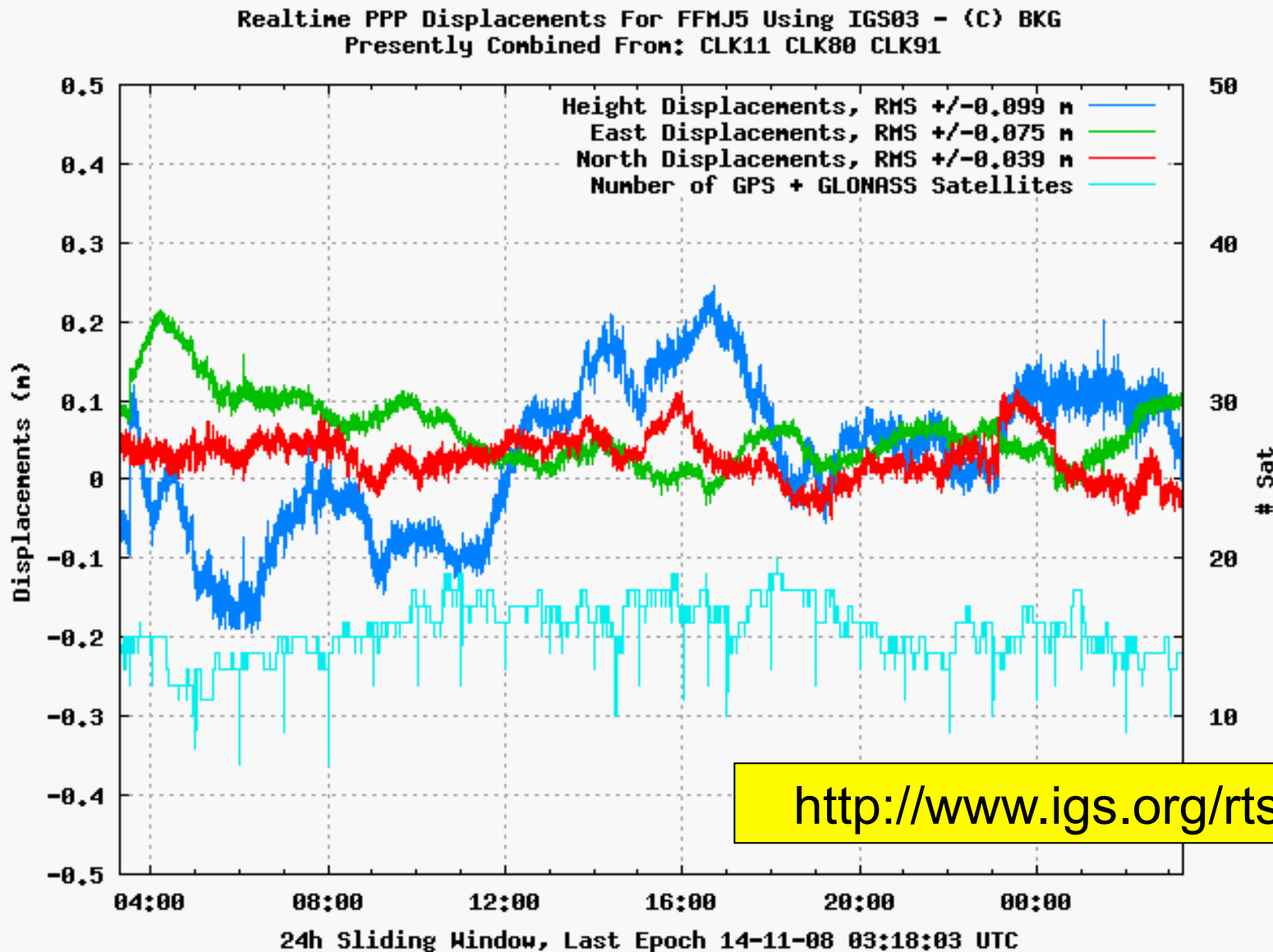


IGS-RTS IGS03...

RT-PPP GPS+GLONASS Results



Frankfurt a.M.

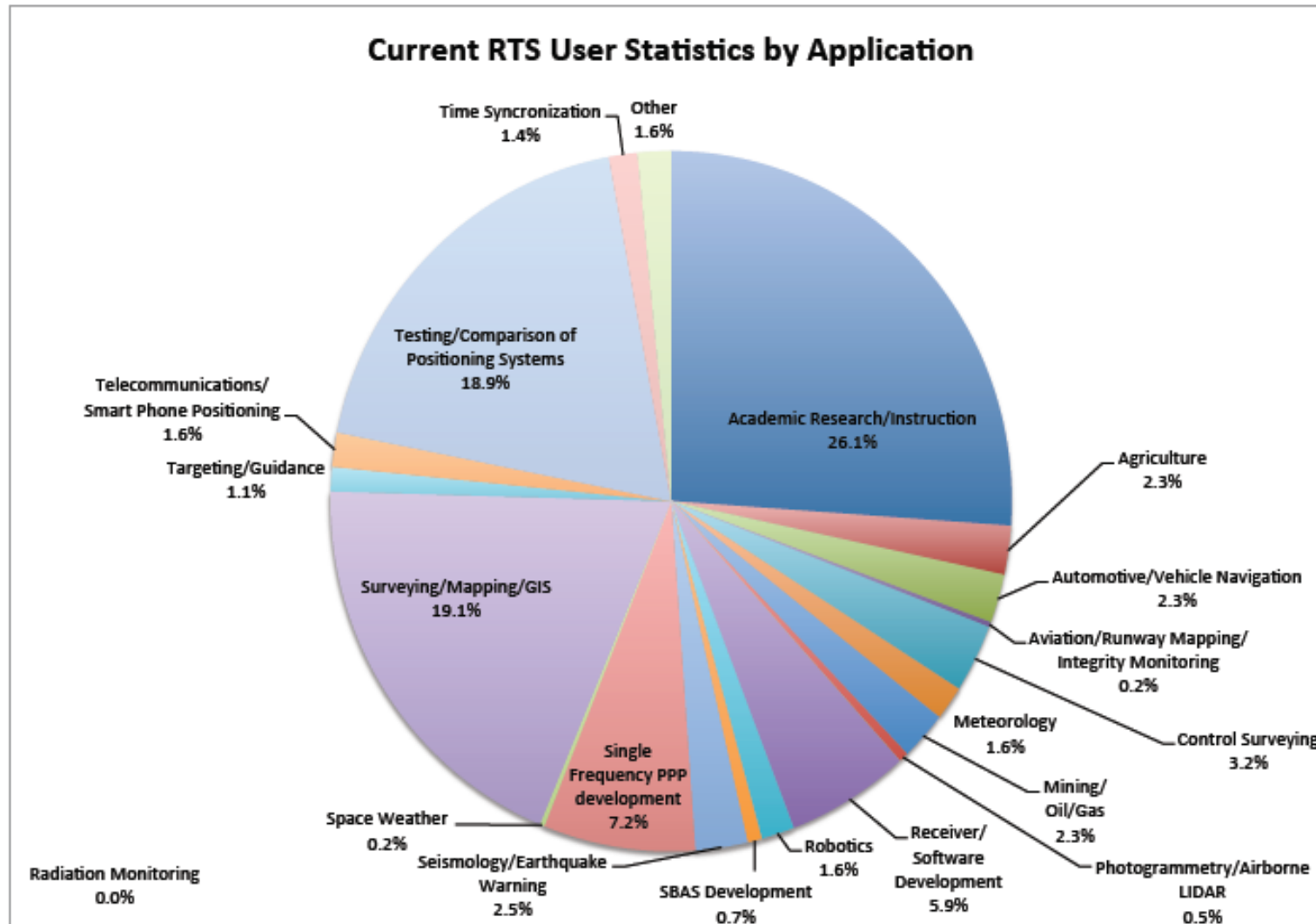


<http://www.igs.org/rt/monitor>

IGS-RTS... *who is using it?*



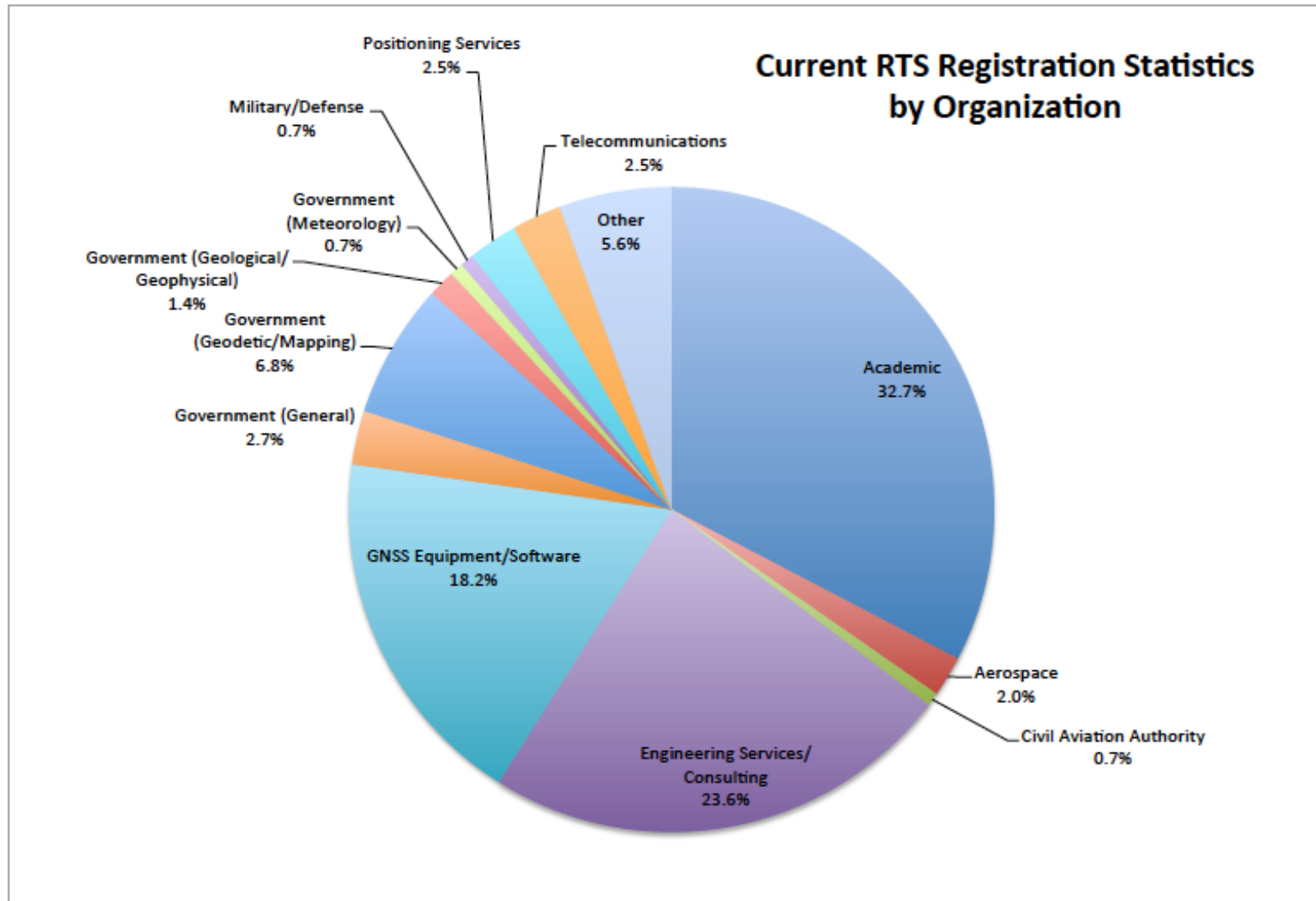
- 80 user registrations within days of launch
- 444 user registrations by 26 September 2014, from 56 countries



IGS-RTS... *who is using it?*



- 80 user registrations within days of launch
- 444 user registrations by 26 September 2014, from 56 countries





- Enables RT-PPP at global scales for **scientific** applications, atmospheric & space weather forecast, multi-constellation performance monitoring, & more...
- E.g. rapidly detecting, locating & characterising hazardous events such as earthquakes & tsunamis
- Contribute to IAG's **GGOS** Theme 2 "Natural Hazards"
- *Support for innovative public benefit applications*



Final Remarks...



- **The IGS ...**

- ... is in its **20th year** of service*

- ... is at the forefront of high quality GNSS product generation*

- ... continues to develop new (& improve existing) products*

- ... has a large & diverse user community*

- ... is well-connected (& respected) beyond scientific community*

- ... has a well-designed governance structure*

- ... is a robust & reliable service*

- ... is evolving into a trusted (& independent) multi-GNSS real-time positioning & system monitoring service*