



International GNSS Service(IGS) Real-Time Service

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Outline



- Introduction to the IGS Real-Time Service (RTS)
- Description of the data collection, computation and correction distribution environment
- Accuracy of the products
- How to access the RT Corrections and Station Data
- Sample RT-PPP Applications
- Future Plans
- Summary

IGS Real Time Service



- International effort with over 25 organizations contributing.
Station Operations, Data Centres, Analysis Centres,
Combination Centres, Analysis Coordination, Caster Operation
...

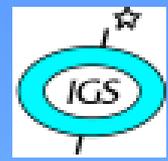


IGS Real Time Service (RTS)



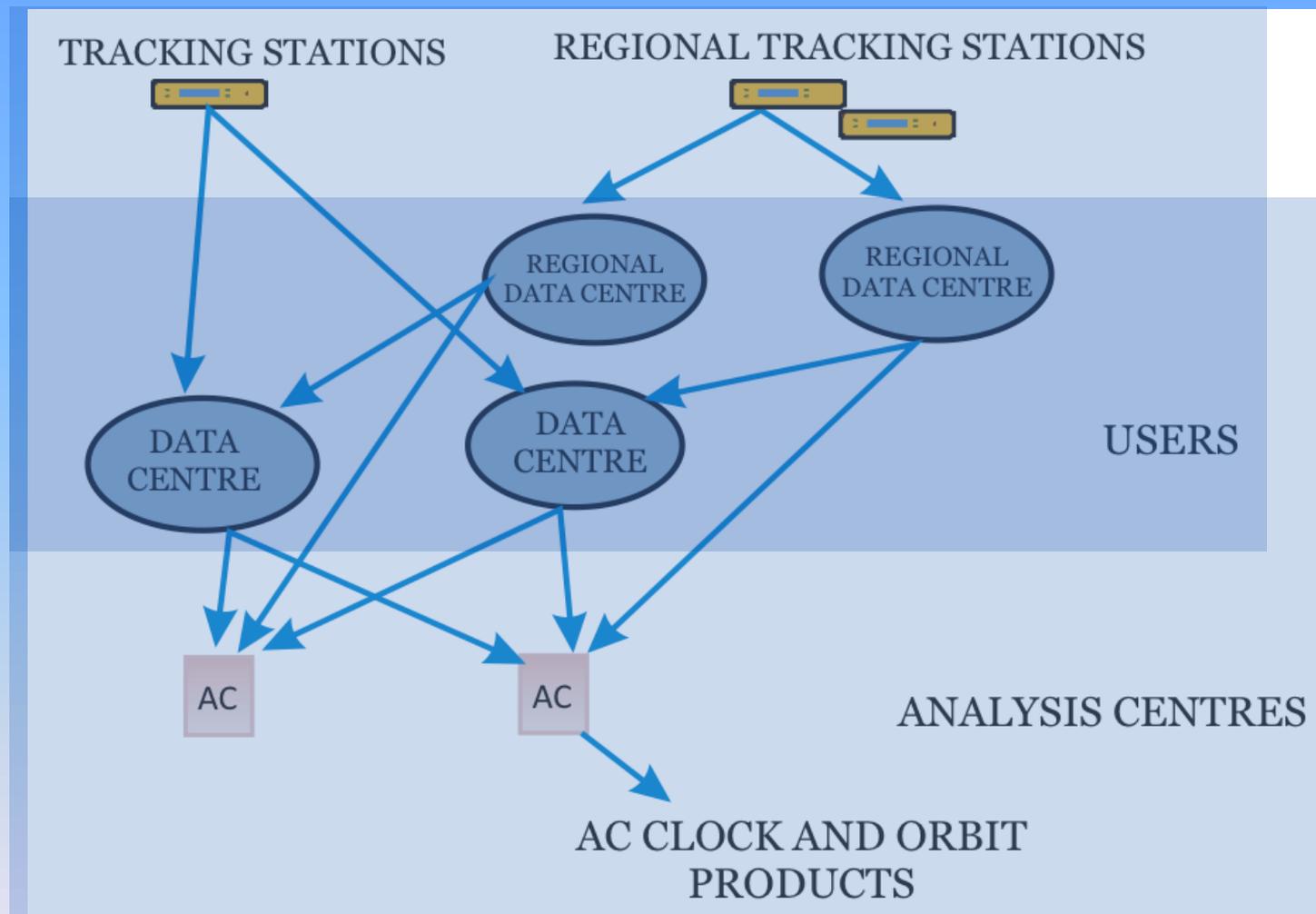
- Large global network 150+ stations
- Robust data collection, analysis and combination methods
- Real-time orbits are accurate to several cm and clocks are sub-nanosecond
- Open station data and correction policy - registration required (indicates that there are no service guarantees) Register at: <http://rts.igs.org>
- GNSS data and corrections are in RTCM formats
- Supports RT-PPP applications

IGS Real-Time Global Network

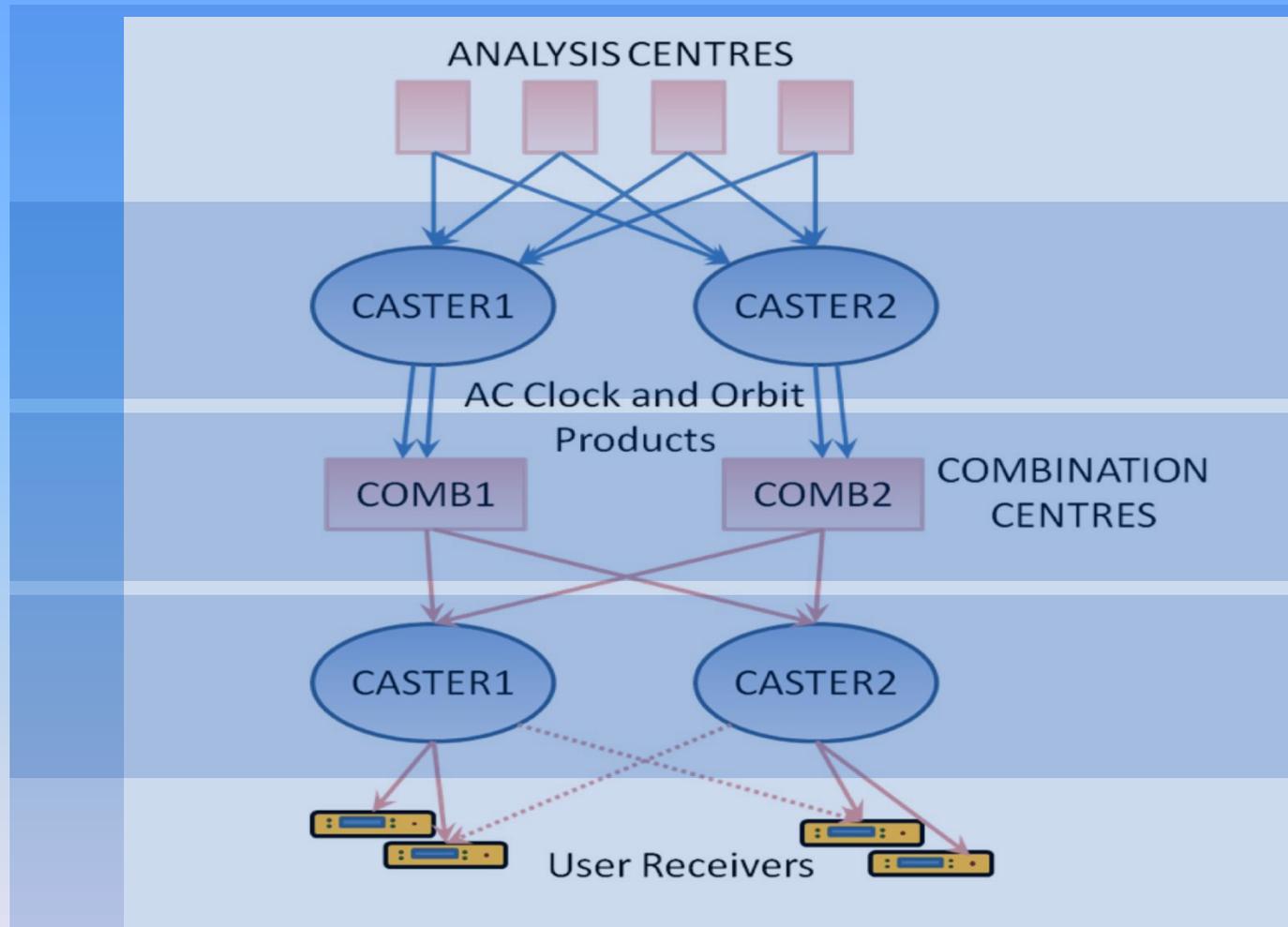


GMT 2013 Sep 4 18:04:12

IGS RTS Data Collection Architecture



IGS RTS Correction Distribution Architecture



IGS RT Analysis Centres



- 10 Analysis Centres:

Center	Description
BKG	GPS RT orbits and clocks using IGU orbits GPS + GLONASS RT orbits and clocks using IGV orbits
CNES	GPS RT orbits and clocks based on IGU orbits GPS+GLONASS orbits and clocks
DLR	GPS RT orbits and clocks based on IGU orbits GPS+GLONASS orbits and clocks
ESA/ESOC	GPS RT orbits and clocks using NRT batch orbits from ESOC s/w running every 2 hours GPS RT orbits and clocks using IGU orbits
GFZ	GPS RT orbits and clocks and IGU orbits
GMV	GPS RT orbits and clocks based on NRT orbit solution GPS+GLONASS orbits and clocks
Geo++	Not contributing at present. Working on RTCM SSR Standard.
NRCan	GPS RT orbits and clocks using NRT batch orbits every hour
TUW	Not contributing at present
WUHAN	GPS RT clocks based on IGU orbits

The following agencies have additional functions in the RTS:

- NRCan – RT Working Group Chair
- ESOC – Real Time Analysis Center Coordinator
- BKG – Data Flow Coordination

IGS Real-Time Products



- **RTS launched 1 April 2013**

Note:

- IGS01/IGC01 (GPS-only) and IGS02 (GPS-only) streams now fully configured and running on 2 or more servers
- IGS03 (GPS+GLONASS) “experimental” stream
- RTCM3EPH streams (GPS, GLONASS, Galileo)
- Reference is ITRF2008
- Stream access via BKG NTRIP Client (BNC) or RTKLIB
- Register for user access: rts.igs.org

Products:

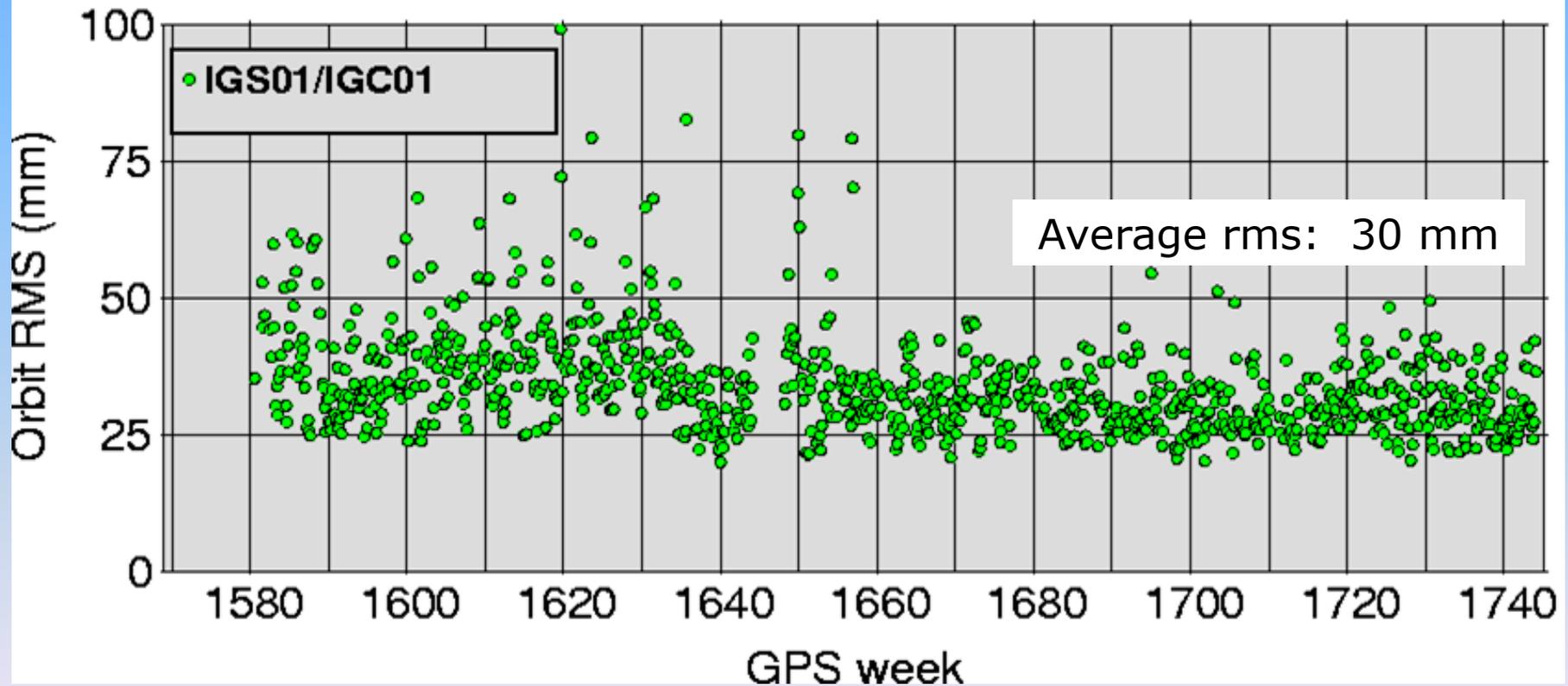
Stream Name	Description	Ref Point	RTCM Messages	Provider / Solution ID	Bandwidth kbits	Software
IGS01	Orbit/Clock Correction, Single-Epoch Combination	APC	1059 (5),1060 (5)	258 / 1	1.8/sec	ESA/ESOC
IGC01	Orbit/Clock Correction, Single-Epoch Combination	CoM	1059 (5),1060 (5)	258 / 9	1.8/sec	ESA/ESOC
IGS02	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.

IGS RTS Product Performance



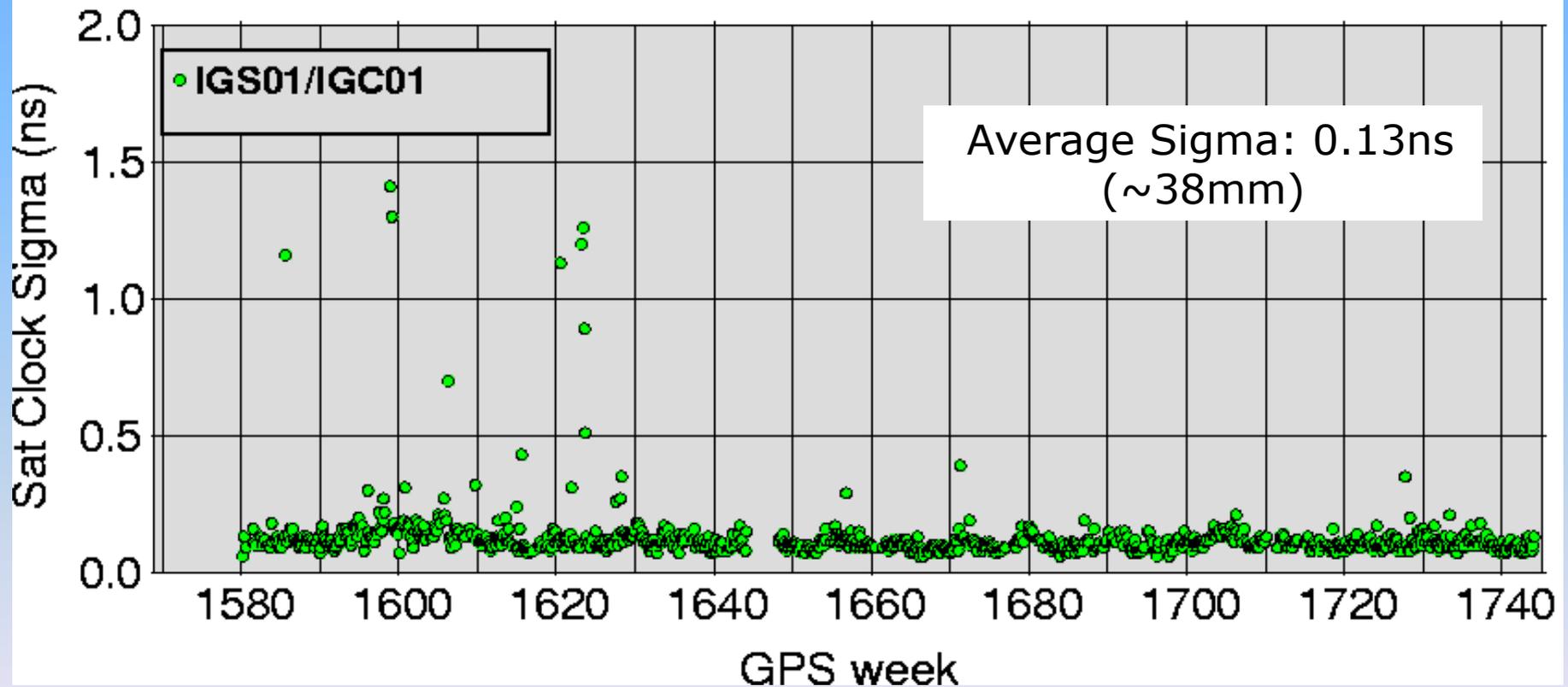
- Satellite orbit RMS (compared to IGS Rapid)



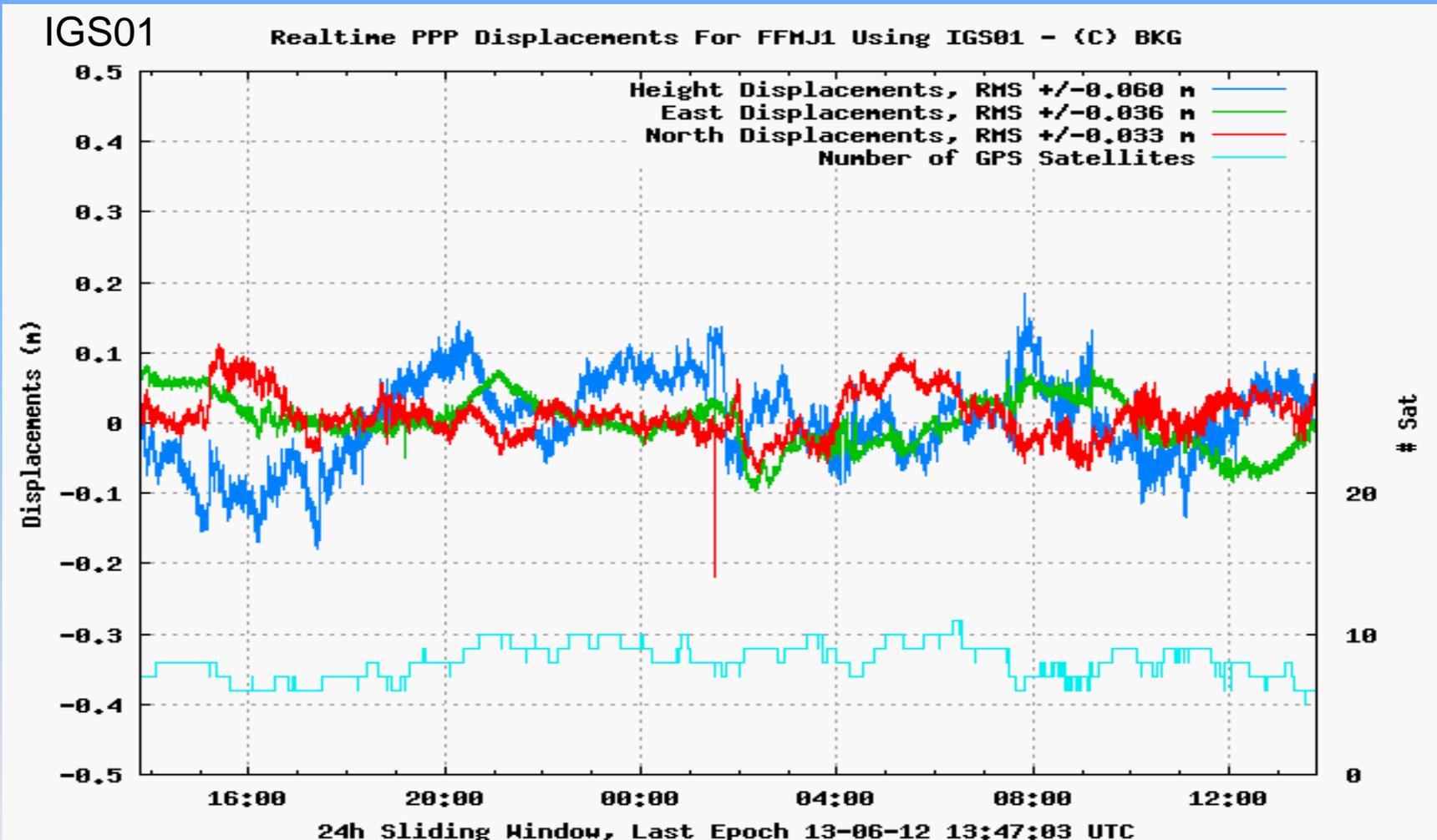
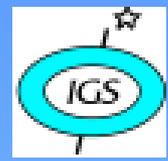
IGS RTS Product Performance



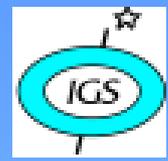
IGS Real-Time Clock Combination (compared to IGS Rapid)



IGS RTS Product Performance

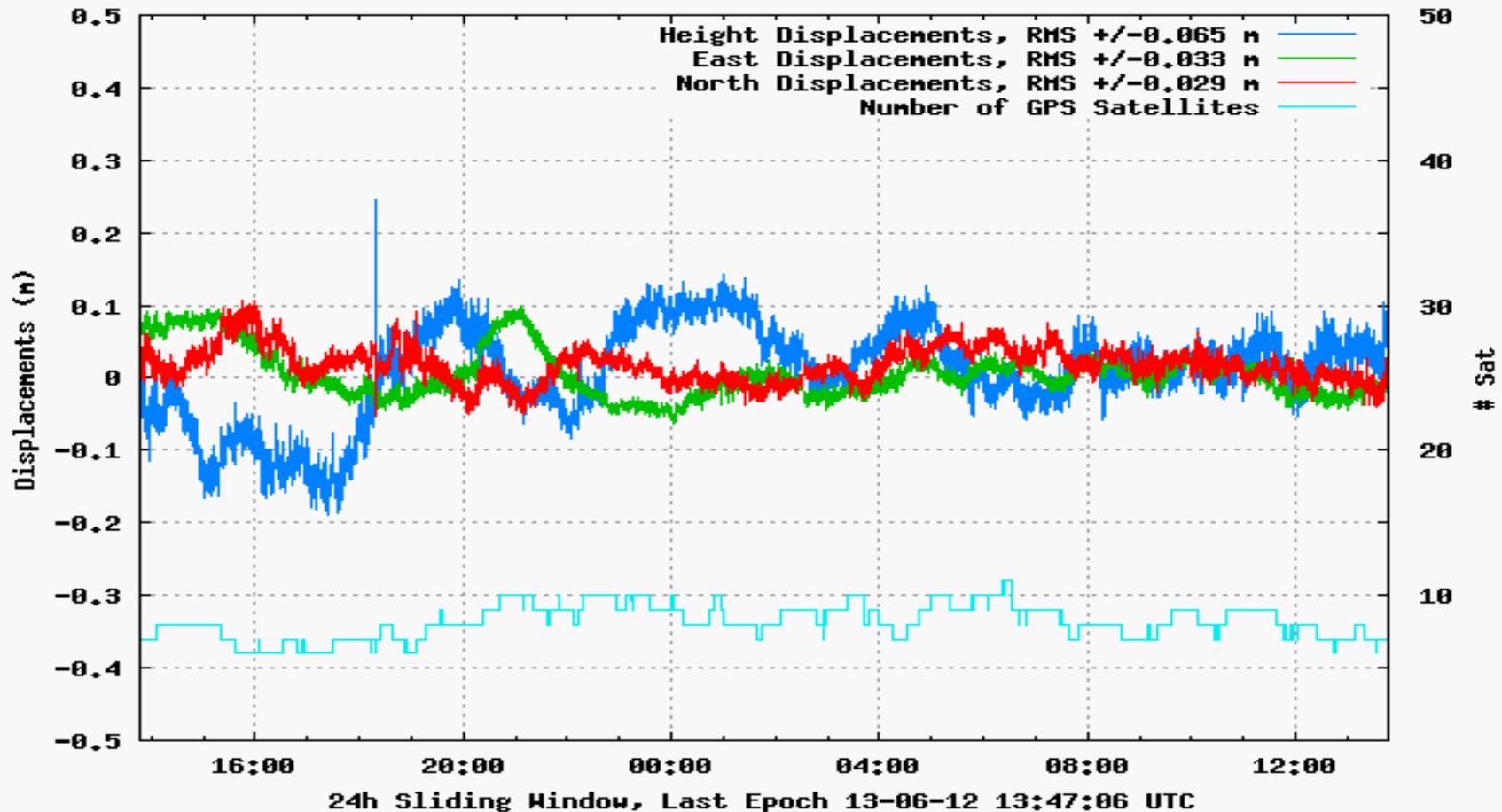


IGS RTS Product Performance



IGS02

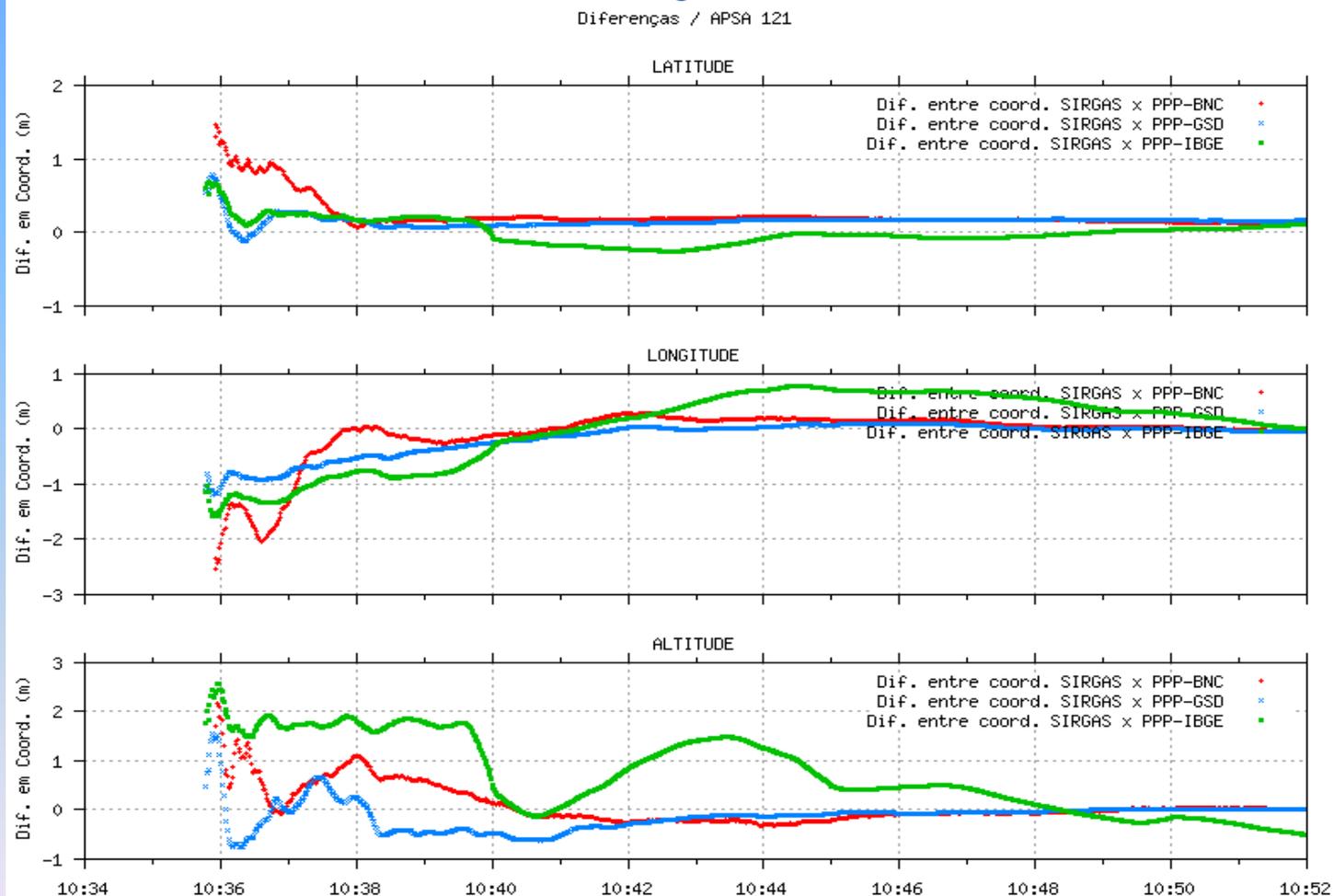
Realtime PPP Displacements For FFMJ1 Using IGS02 - (C) BKG
Presently Combined From: CLK10 CLK22 CLK53 CLK70 CLK80 CLK93



IGS RTS Product Performance



Note: results from IBGE Brazil using BNC with RBMC station data



Useful Links to IGS RTS Information



- IGS Real-Time Service home page: <http://rts.igs.org>
- Primary RTIGS Data Caster: <http://www.igs-ip.net>
- RTS Station Monitoring:
 - <http://igs.bkg.bund.de/ntrip/PPP>
 - <http://igs.bkg.bund.de/ntrip/workload>
 - http://www.rtigs.net/nrcan_monitor.php
 - http://www.igs.oma.be/real_time
 - <http://www.igs.oma.be/highrate>
- NTRIP and RT-PPP Software :
 - <http://www.rtklib.com>
 - <http://igs.bkg.bund.de/ntrip/download>

Sample IGS RTS Applications



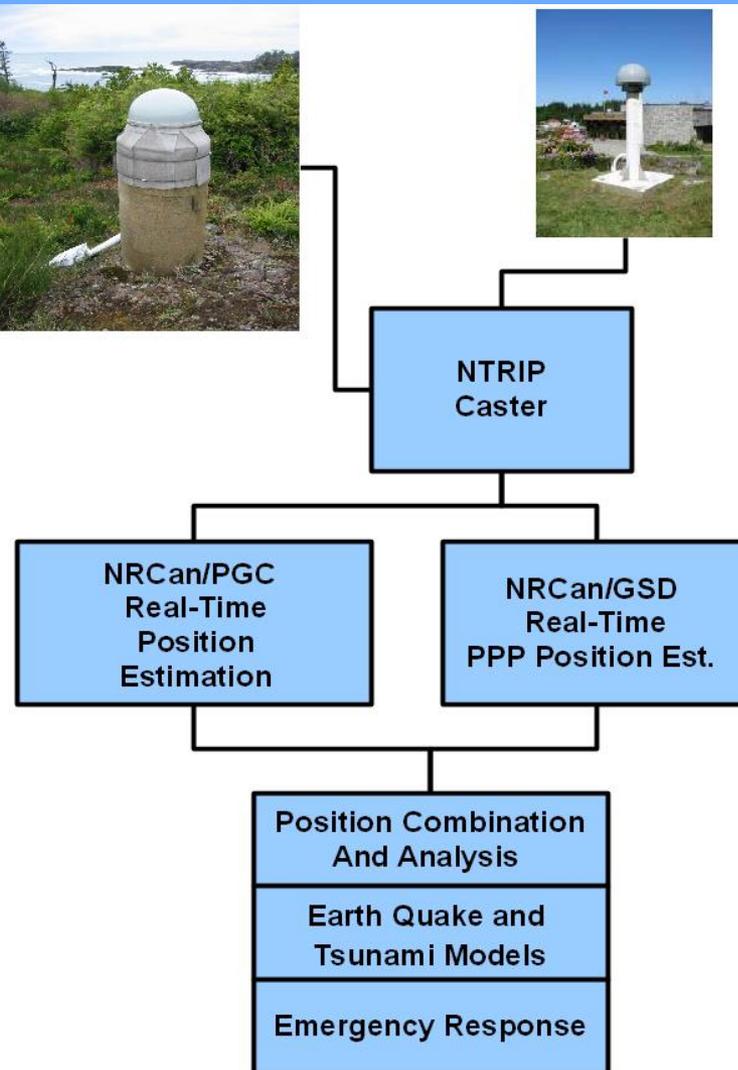
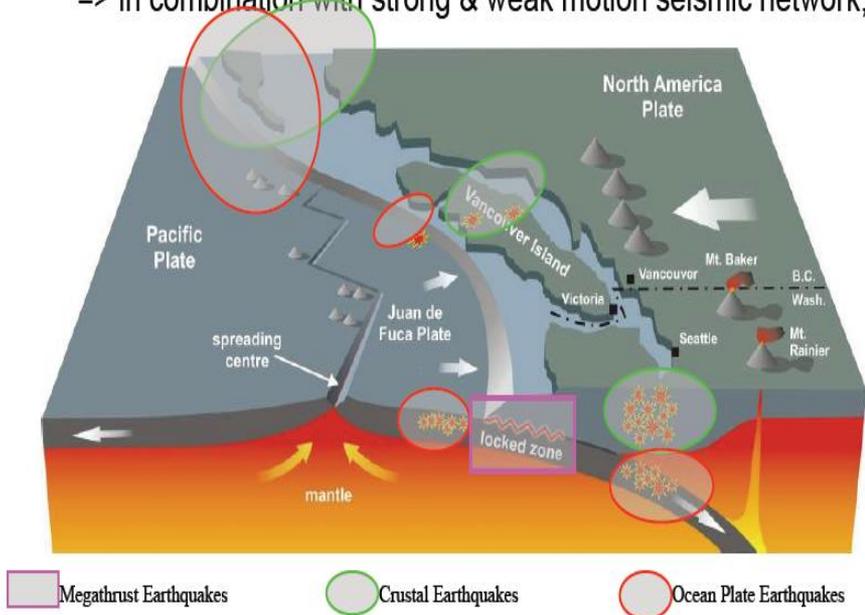
- Supports : GIS, Mapping and Surveying applications that require 10cm 2DRMS positioning
- Enables real time precise point positioning (PPP) at global scales for scientific and natural hazard detection applications
 - Enables real-time troposphere and space weather monitoring
 - Enables rapid detection, location, and characterization of hazardous events such as earthquakes and tsunamis
- GNSS multi constellation performance monitoring
- Supports Global Geodetic Observing System (GGOS)

Prototype Real-time Natural Hazards GNSS Network and Infrastructure



Real-time GNSS Objectives

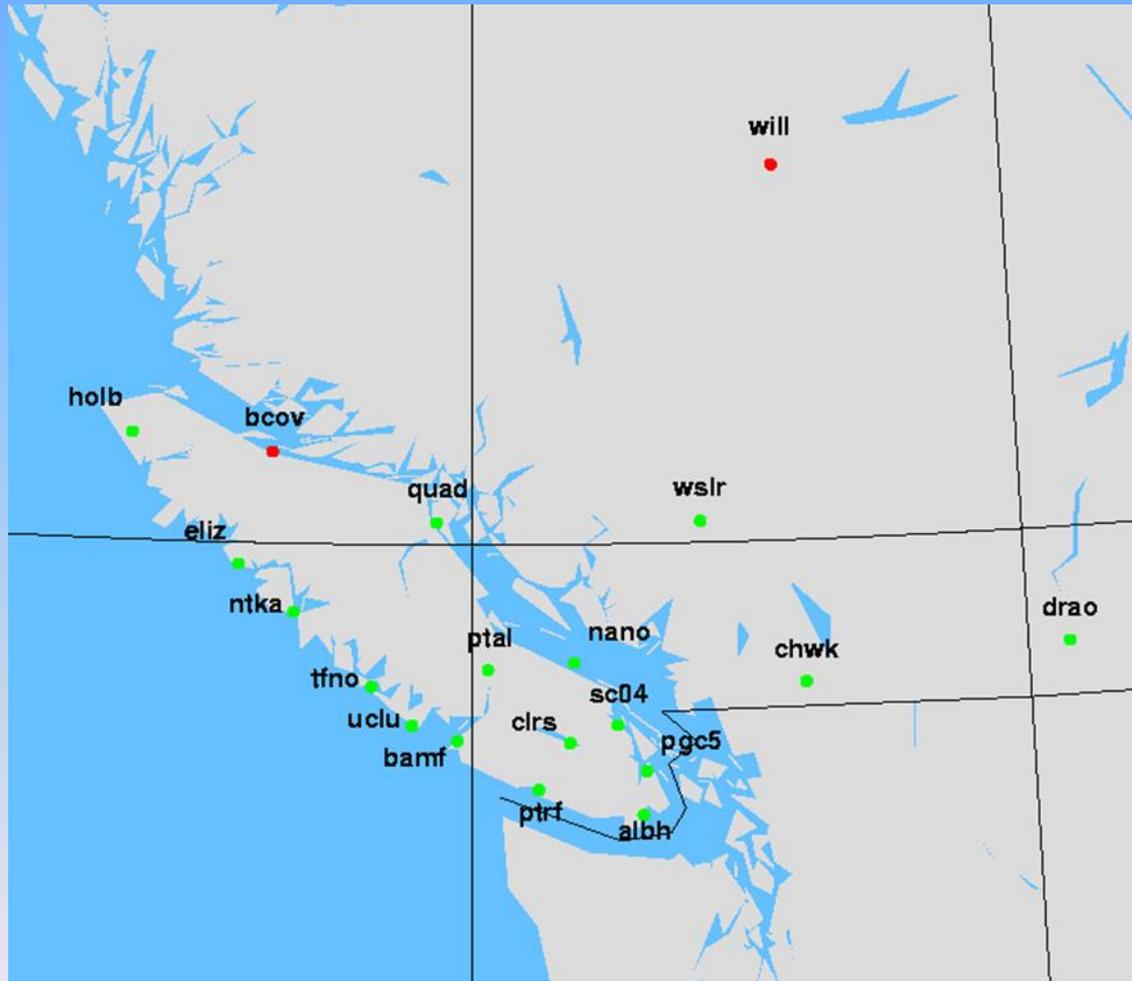
- Detect co-seismic displacement in Real Time
- Differentiate:
 - Large-scale tsunamigenic events from
 - Non-tsunamigenic offshore earthquakes;
- Enhance warning and emergency response
=> in combination with strong & weak motion seismic network;



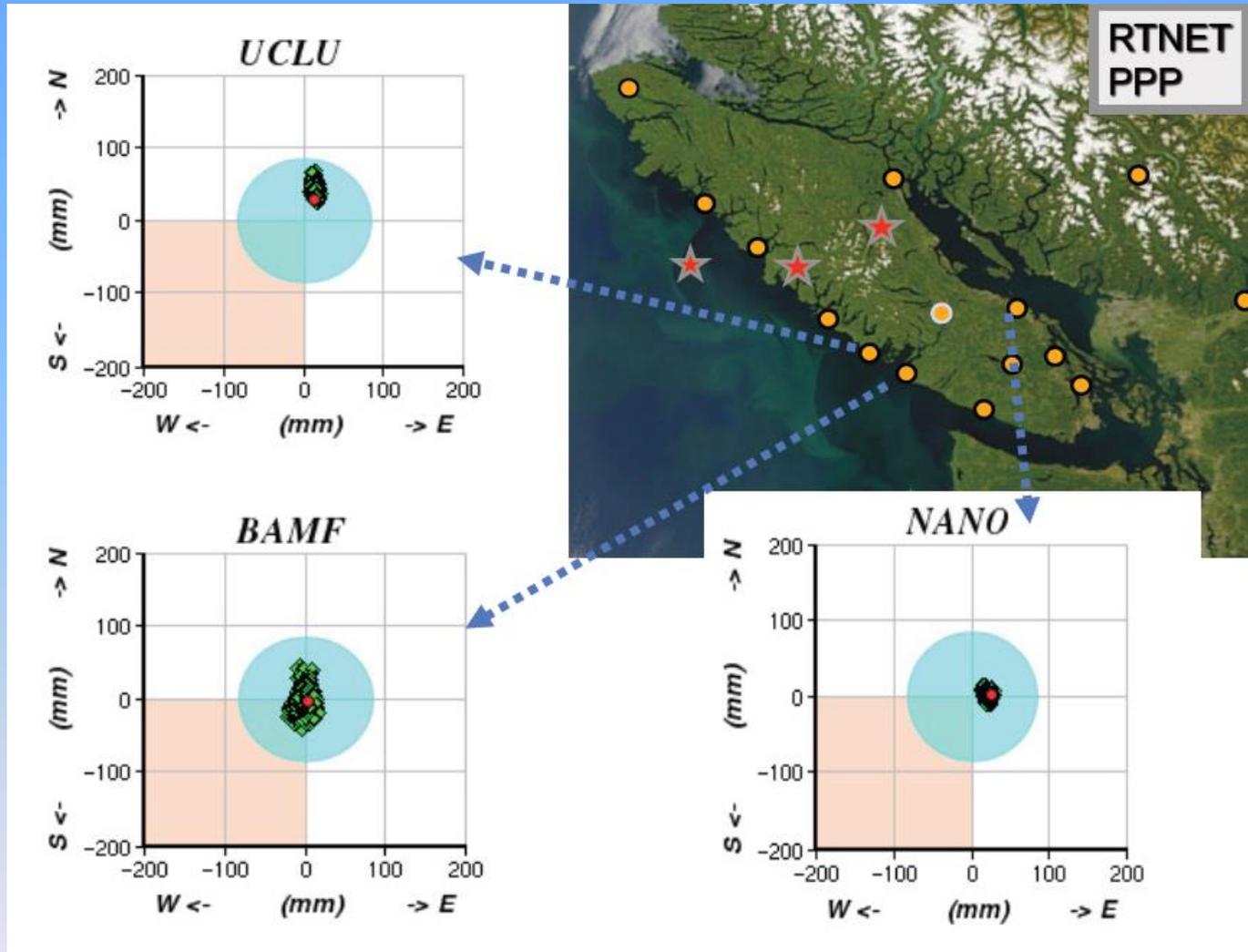
NRCan Natural Hazard Application



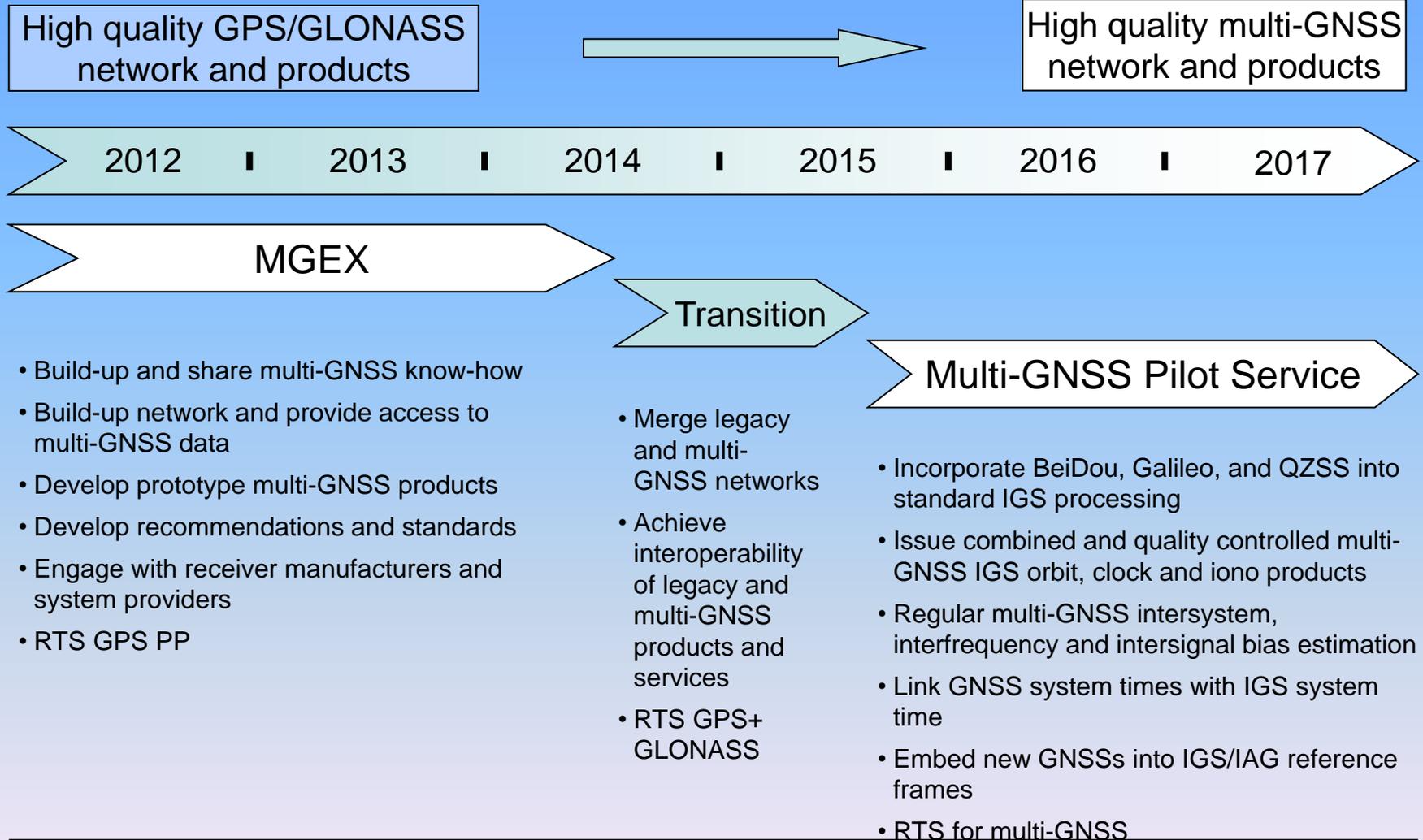
- Natural Resources Canada, Western Deformation Array



Prototype Natural Hazards User Console



IGS Multi-GNSS Plan



Summary



- RTS is now officially launched providing open access through a registration process: <http://rts.igs.org>
- The RTS is based on a robust architecture with sufficient built in redundancy
- RTS products are accurate and precise as indicated by the quality assurance indicators
- The RTS is targeting public good applications including the GGOS natural hazards theme
- Demonstrated interest since launch is very encouraging
- Full support for GLONASS is being worked on and support for all GNSS constellations is planned