

# Current Status of the IGS Reprocessing



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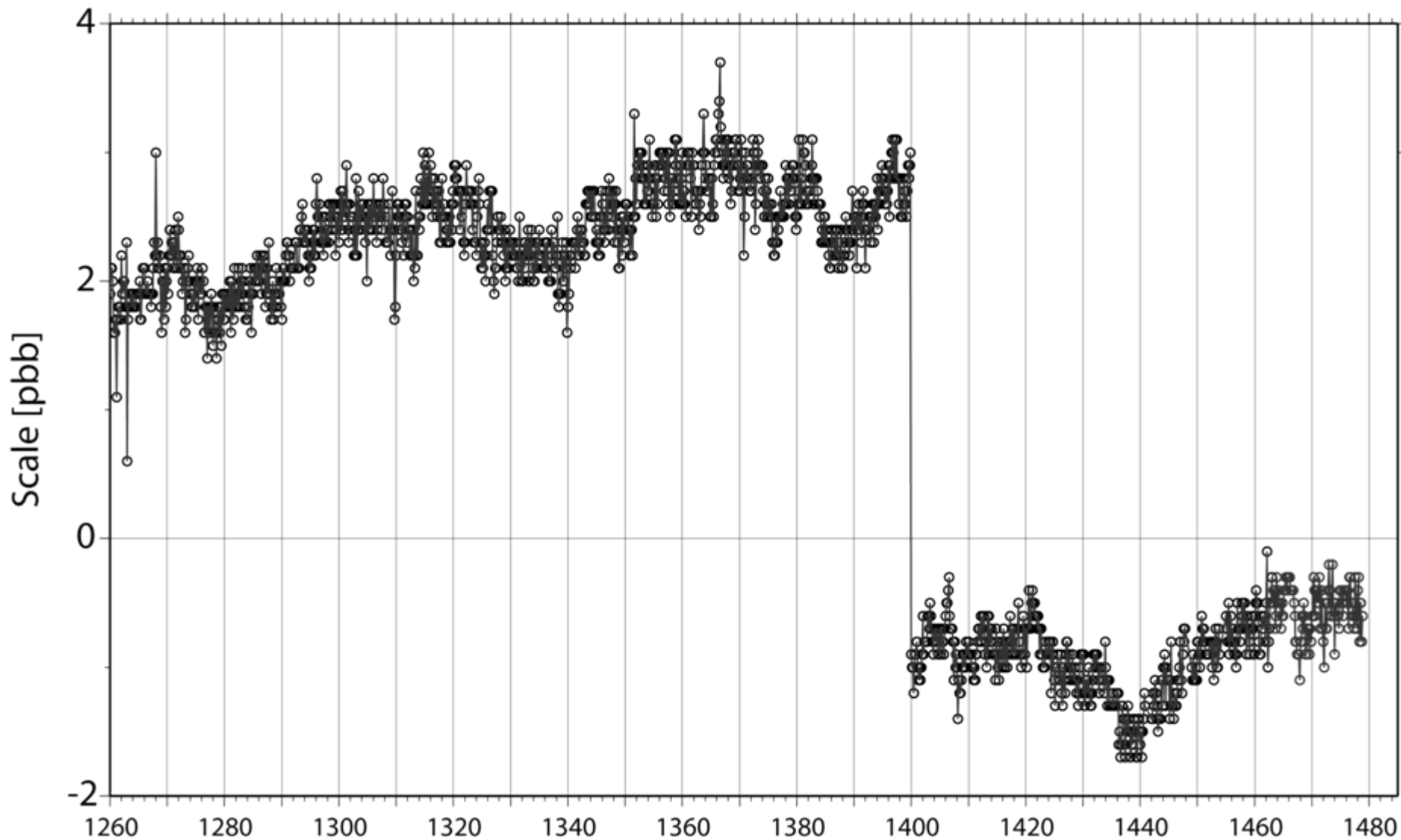


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# Motivation

- **Significant and numerous improvements** in ACs' processing strategies and modeling have been implemented since the official start of the IGS in January 1994
- Therefore, time series of **operational IGS products** are **inhomogeneous** and affected by reference frame changes.
- Geophysical interpretation of these inhomogeneous IGS time series is difficult
- Major discontinuity introduced in November 2006 (Week 1400)
  - absolute antenna phase center model
  - ITRF2005 (IGS05)
- Inclusion of **more stations**:
  - Processing limitations in the early years
  - Data not available in time for operational processing

# PPP with IGS Final Orbits and Clocks



NOAA NGS, 24.05.2008 19:07 (GMT)

# Major Goals of the IGS Reprocessing

- Generate **homogeneous** and **consistent** long time series of combined **IGS products** computed with up-to-date models and standards:
  - station coordinates,
  - Earth rotation parameters,
  - satellite orbits,
  - satellite and station clocks

for the time period **January 1994 till December 2007**

- Provide **input** for the next **realization of the ITRS**
- Basis for the generation of a **new satellite antenna phase center model** (satellite antenna offsets are given in the SINEX files of some ACs)

# History of the IGS Reprocessing

- 2004 Workshop Recommendation 2.9: “The ACs should be prepared to reprocess the IGS data. The detailed procedure should be discussed after the absolute antenna phase center variation models are decided (see Antenna session).”
- July 2005 **Call for Participation** (IGSMAIL-5175)
- November 2005 Station operator asked to check data archives
- 2006 Workshop Session “Reprocessing Issues, Standardization, New models”
- Summer 2007 first results for a 3 months **test period** in 2000
- February 2008 **Start** of the 1st IGS reprocessing campaign

# Reprocessing Analysis Centers

<b>Abb.</b>	<b>Analysis Center</b>	<b>Country</b>
<a href="#">em1</a>	National Resources Canada	Canada
<a href="#">es1</a>	European Space Operations Center	Germany
<a href="#">gf1</a>	GeoForschungsZentrum Potsdam	Germany
<a href="#">jp1</a>	Jet Propulsion Laboratory	USA
<a href="#">mi1</a>	Massachusetts Institute of Technology	USA
<a href="#">ng1</a>	National Geodetic Service	USA
<a href="#">pd1</a>	Potsdam Dresden Reprocessing	Germany
<a href="#">si1</a>	Scripps Institution of Oceanography	USA

# Reprocessing Combination Centers

## Natural Resources Canada (NRCan)

- weekly SINEX combination
- Terrestrial Reference Frame

Talk by R. Ferland

## GeoForschungsZentrum (GFZ) Potsdam

- Orbit combination
- Clock combination

Talk by G. Gendt

## Naval Research Laboratory (NRL)

- Timescale (not yet available)

# Products of the 1st IGS Reprocessing Campaign

## Weekly **SINEX** files (\* .snx)

- Station coordinates
- Earth rotation parameters: polar motion + rates, LOD
- Apparent geocenter
- Satellite antenna offsets  
(only some ACs, not included in combined files)

## Daily **orbit** files (\* .sp3)

- satellite positions and clocks with 15 min time resolution

## Daily **clock** files (\* .c1k)

- satellite and receiver clocks with 30 s or 5 min time resolution  
(AC dependent, 5 min for combined clocks)

## Weekly **Earth rotation parameter** files (\* .erp)

- 24 h time resolution

# File Naming (1)

`ftp://cddis.gsfc.nasa.gov/gps/products/  
/www/repro# / cc#wwwd.typ.z`

#	Reprocessing campaign number: 1, 2, ...
cc	first two characters of the AC code ig# for combined IGS products
www	GPS week
d	Day of week
typ	File type: snx, ssc, sp3, clk, erp, sum

## File Naming (2)

Example: Combined orbit of the first IGS reprocessing campaign,  
week 1400, day 3

```
ftp://cddis.gsfc.nasa.gov/gps/products/  
/1400/repro1/ig114003.sp3.z
```

**/repro#**

Concatenated Earth rotation parameters: **ig108p01.erp**

Links to weekly directories **/www/repro#/**

Primary Data Center: **CDDIS**

+ distribution to Global Data Centers **IGN, SIO and KASI**

# File Archiving

As soon as the 1st reprocessing campaign is concluded

- **Operational files** will be moved to:

.../www/orig

- Files of the 1st reprocessing campaign will be linked through week 1459 (December 2007)

from .../www/repro1/cc1wwwwd.typ.Z

to .../www/ccwwwwd.typ.Z

- Users can always access the **latest IGS products** at

.../www/ccwwwwd.typ.Z

- The same procedure will be valid for future reprocessing campaigns

# Current Status

Files available at CDDIS/GFZ Potsdam:

AC	2000	2007	sp3	erp	clk	snx	sum
em1	--	--	x	x	5 min	x	
es1	1042-1055	1408-1459	x	x	5 min	x	x
gf1	1043	1410-1459*	x	x	5 min	x	x
jp1	--	--	x	x	30 sec	x	
mi1	1042-1061	1408-1459	x	x	30 sec	x	x
ng1	1042-1060	1448-1459	x	x	-	x	x
pd1	1042-1060	1408-1459	x	x	-	x	-
si1	1042-1060	1408-1459	x	x	-	x	x

Status: 29 May 2008

\* 7 week missing during that time period

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ng1	1042-1060	1448-1459	X	X	-	X	X
pd1	1042-1060	1408-1459	X	X	-	X	-
si1	1042-1060	1408-1459	X	X	-	X	X

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# Timetable

<b>AC</b>	<b>Time/year</b>	<b>Start</b>	<b>End</b>
<b>em1</b>	1-2 month	July 2008	end of 2009
<b>es1</b>	4 days (single PC)	✓	end of 2008
<b>gf1</b>	1 week	✓	October 2008
<b>jp1</b>	1 week	end of June	end of 2008
<b>mi1</b>		✓	
<b>ng1</b>		✓	
<b>pd1</b>	1 week	✓	autumn 2008
<b>si1</b>		✓	

Combined weekly SINEX files: 1 month/year

# Recommendations: Antenna Model

**REPRO-4:** The IGS absolute antenna calibration file should be updated before the start of each new reprocessing campaign, including all available robot calibrations for receiver antennas and satellite-specific antenna offsets available in the SINEX files of the previous reprocessing campaign.

ANTEX file used for the current reprocessing: igs05\_1461.atx

## Recent changes for receiver antennas:

- 7 converted calibrations from NGS added
- 6 robot calibrations from GEO++ added
- 5 converted NGS calibrations replaced by robot calibrations

Currently 6 GPS satellites with preliminary z-offsets (block mean)

# Recommendations: SLR Orbit Validation

**REPRO-5:** (Refreshment of WS06-REPR10): Reprocessed orbits should be validated computing SLR residuals.

AC capability to compute SLR range residuals with their AC software

EMR	ESA	GFZ	JPL	MIT	NGS	PDR	SIO
<b>x</b>	✓	<b>x</b>	✓			✓	

AC willing to provide SLR range residuals for SVN 35 and 36

EMR	ESA	GFZ	JPL	MIT	NGS	PDR	SIO
--	✓	--	✓			✓	

**Who will do the analysis of these residuals?**

# Posters/Further Information

## Posters:

- Rohde et al.: *The GPS data reanalysis campaign at the National Geodetic Survey*
- Steigenberger et al.: *PDR GPS satellite orbits*
- Thomas et al.: *Water vapour estimates over Antarctica from 12 years of globally reprocessed GPS solutions*
- T.A. Springer et al.: *ESOC IGS reprocessing (details)*

Further information and preliminary results: IGS ACC webpage

<http://www.ngs.noaa.gov/igsacc/WWW/reprocess.html>

Discussion of all recommendations at the end of the session

# Summary

- After several tests, the **first IGS reprocessing** campaign has started in February 2008
- **First results** for a three months period in 2000 and for 2007 are **available** (some ACs still missing), more details in the following talks
- First complete AC series for the time period 1994 – 2007 will be available by the **end of 2008**
- **Preliminary combined products** are expected to be available by the **end of 2009**
- First IGS reprocessing campaign is expected to be **concluded in 2010**