

IGS Contribution to ITRF2004

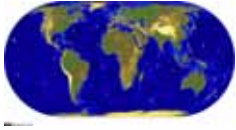
Rémi Ferland
Geodetic Survey Division



Natural Resources
Canada

Ressources naturelles
Canada

Canada



Contents

1. *Weekly solutions*
2. *Discontinuity Tables*
3. *Cumulative Solution*
4. *Reprocessing Activity*
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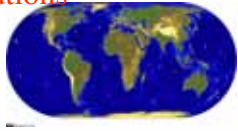




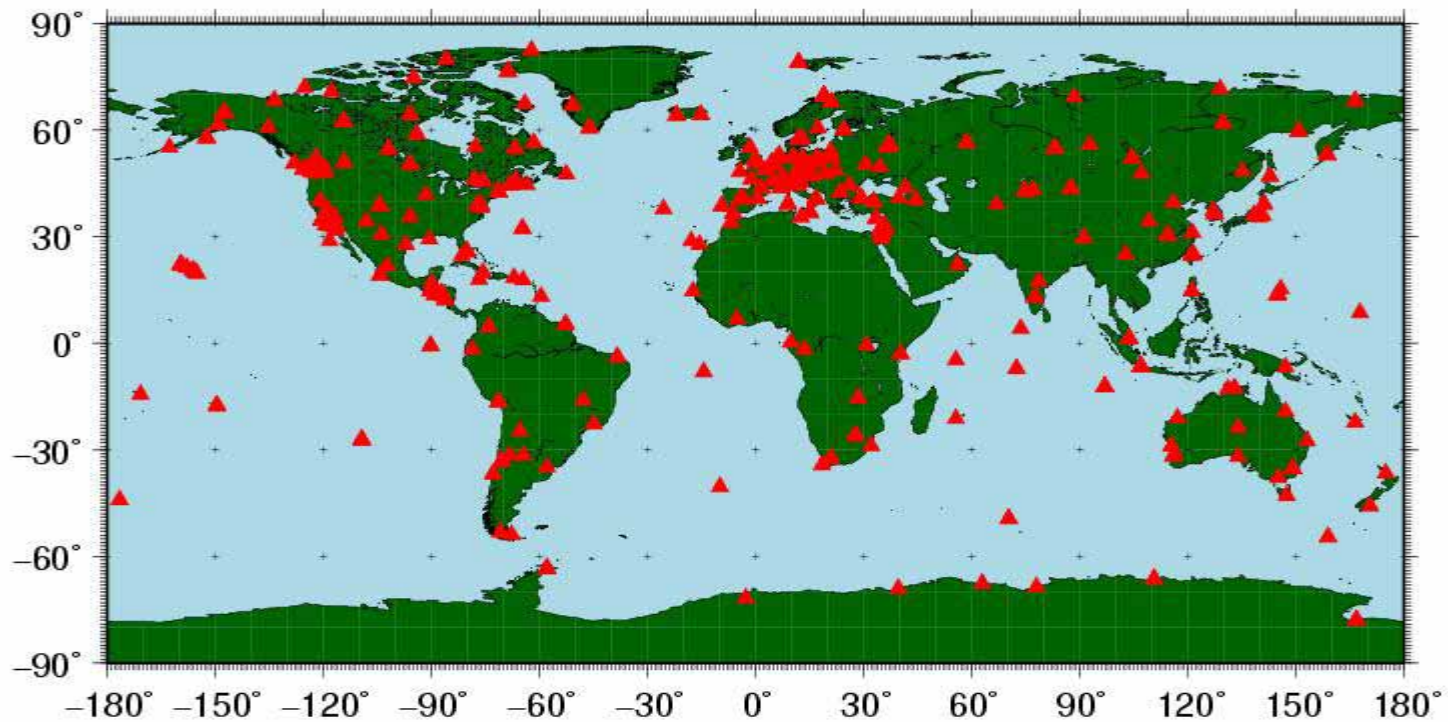
1. Weekly Solutions

- Contributed Stations
- IGS Network Evolution
- Consistency/Precision Evolution
 - Coordinates
 - ERP's
 - Geocenter





Contributed Stations



334 Sites
502 Estimates



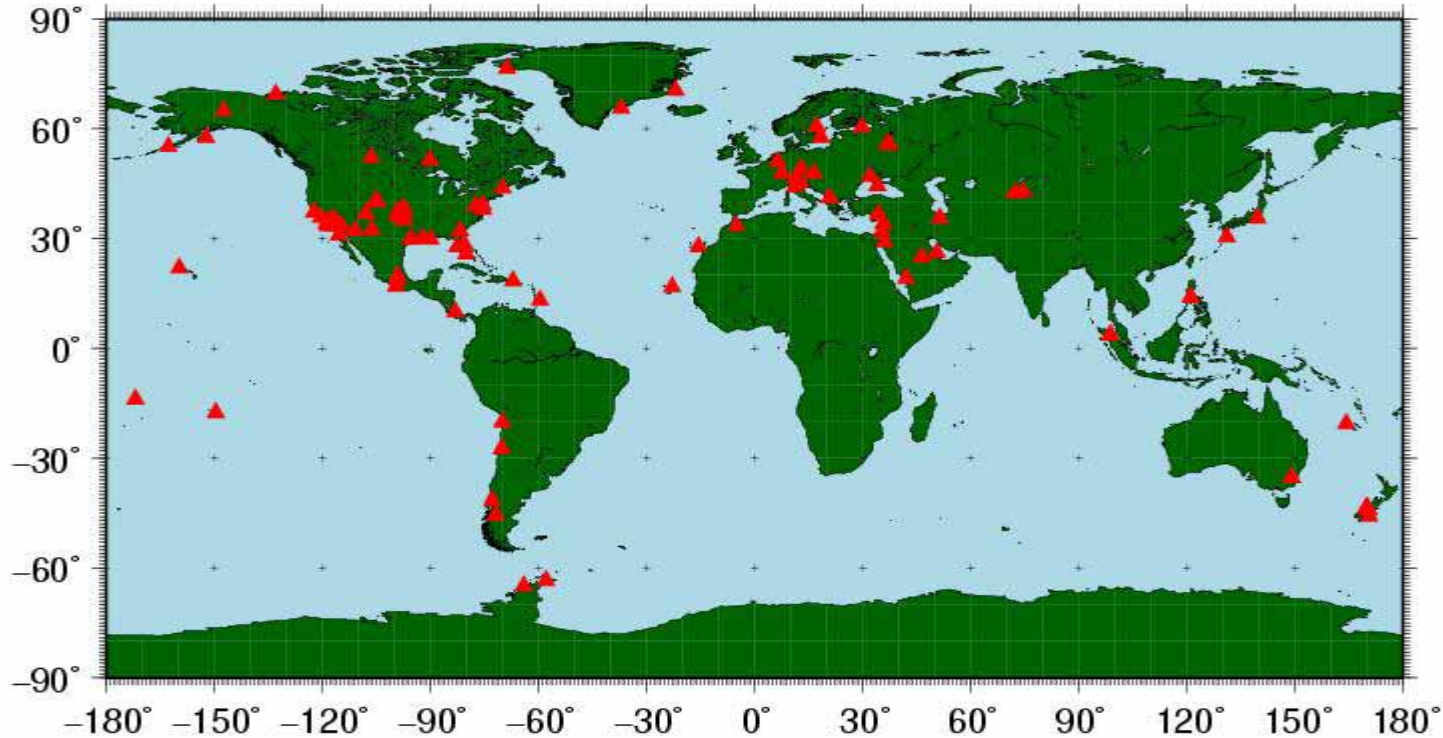
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Excluded Stations



One or more of
the following:

- Non-IGS
- No DOME
- No log
- Very short time span
- Missing Velocity

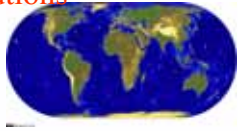
131 Sites



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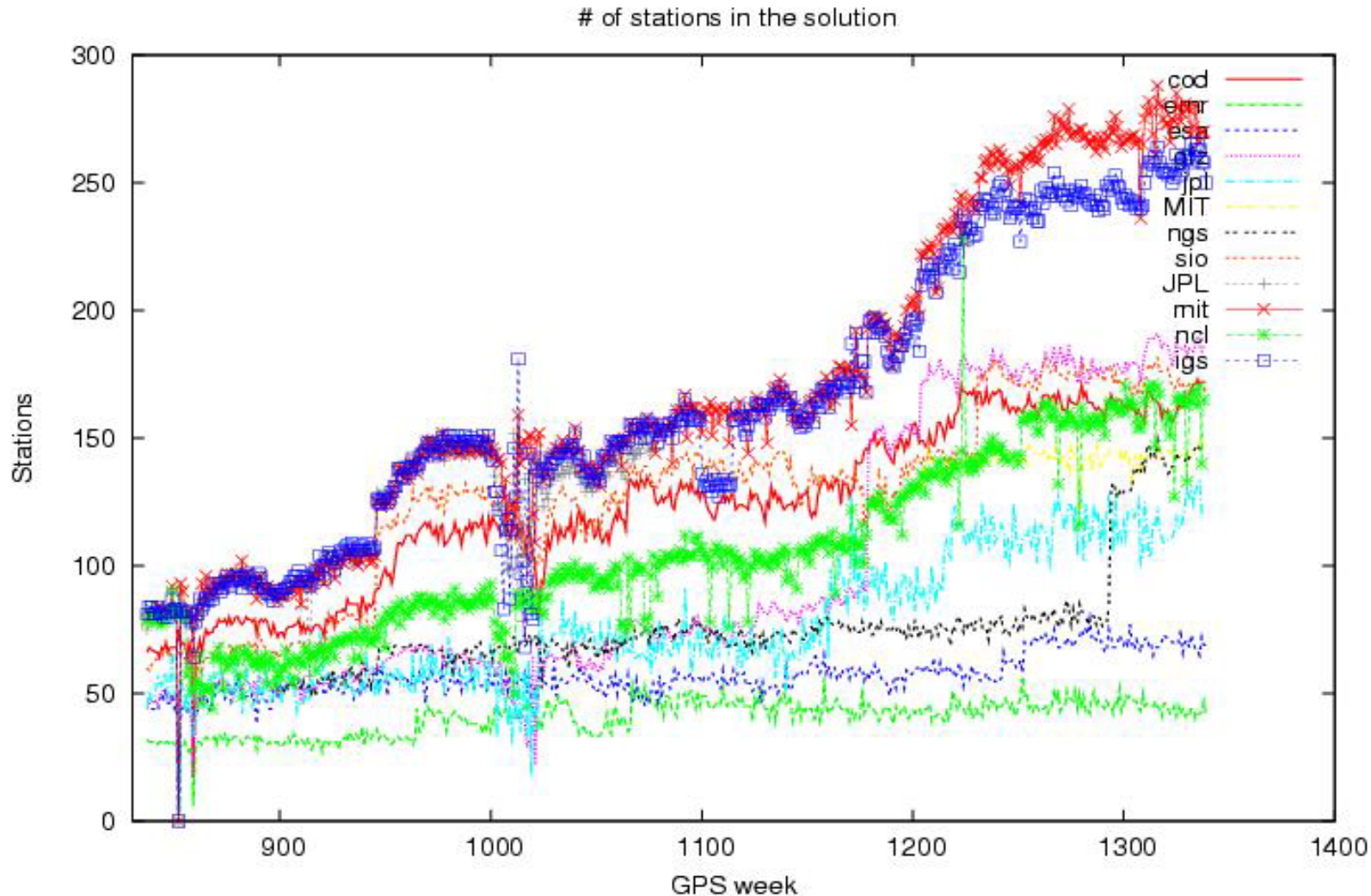
IGS Network Evolution

ACs:

- cod
- emr
- esa
- gfz
- jpl
- MIT
- ngs
- sio

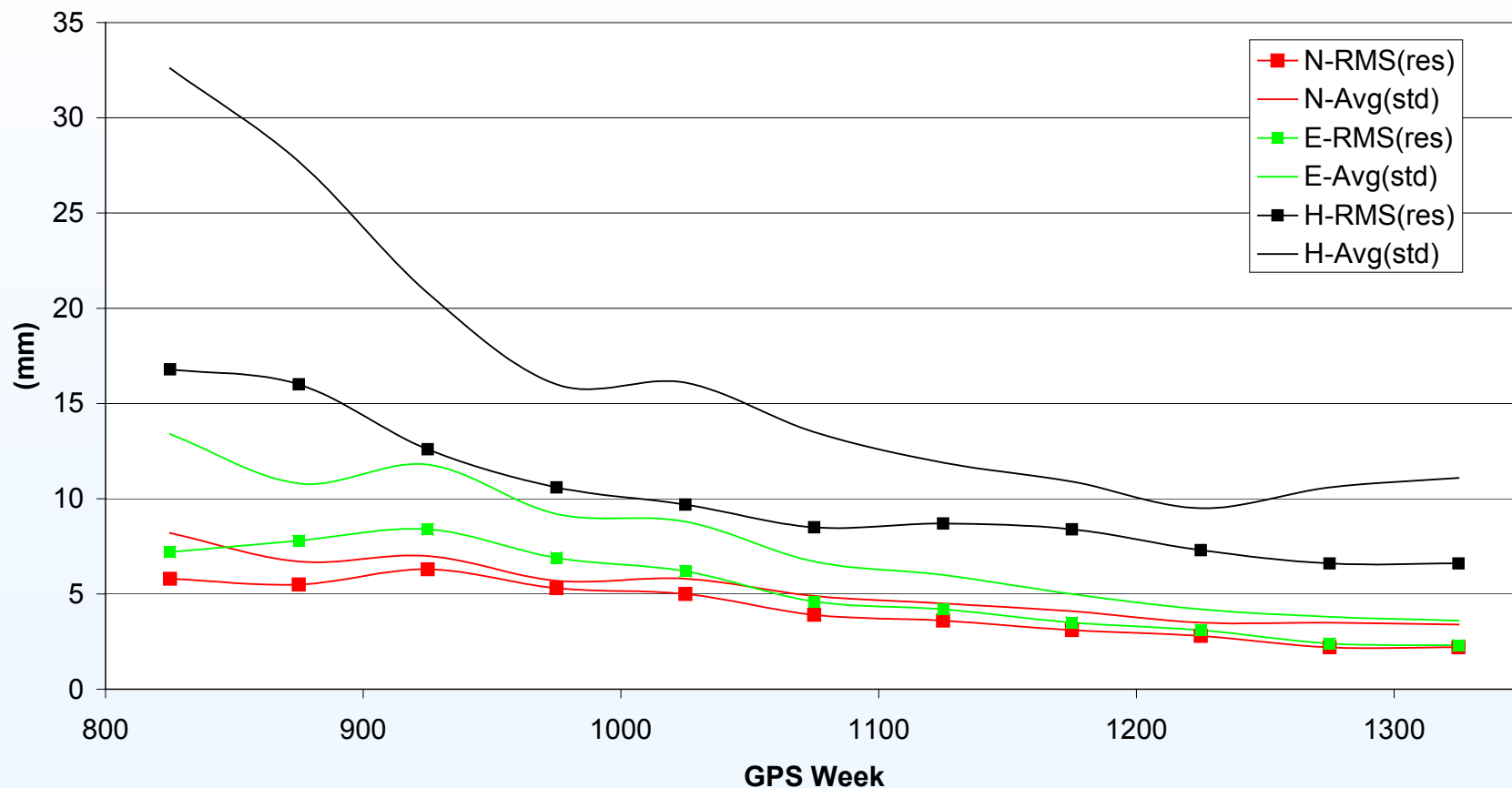
GNAAC:

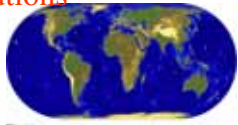
- JPL
- mit
- ncl



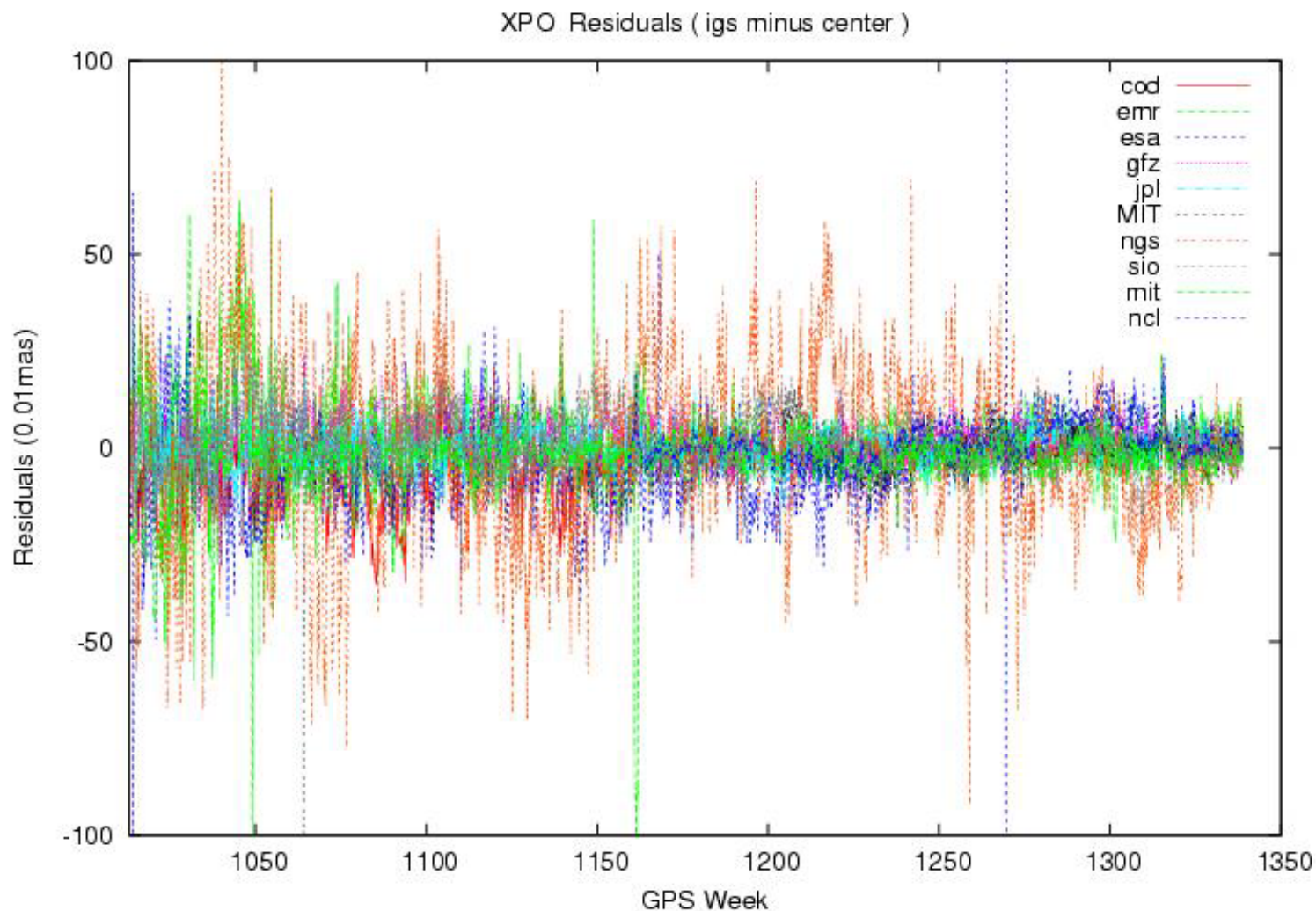
ACs Coordinates Precision Evolution

ACs Coordinates Residuals RMS & Average Standard Deviation





X Pole Residuals



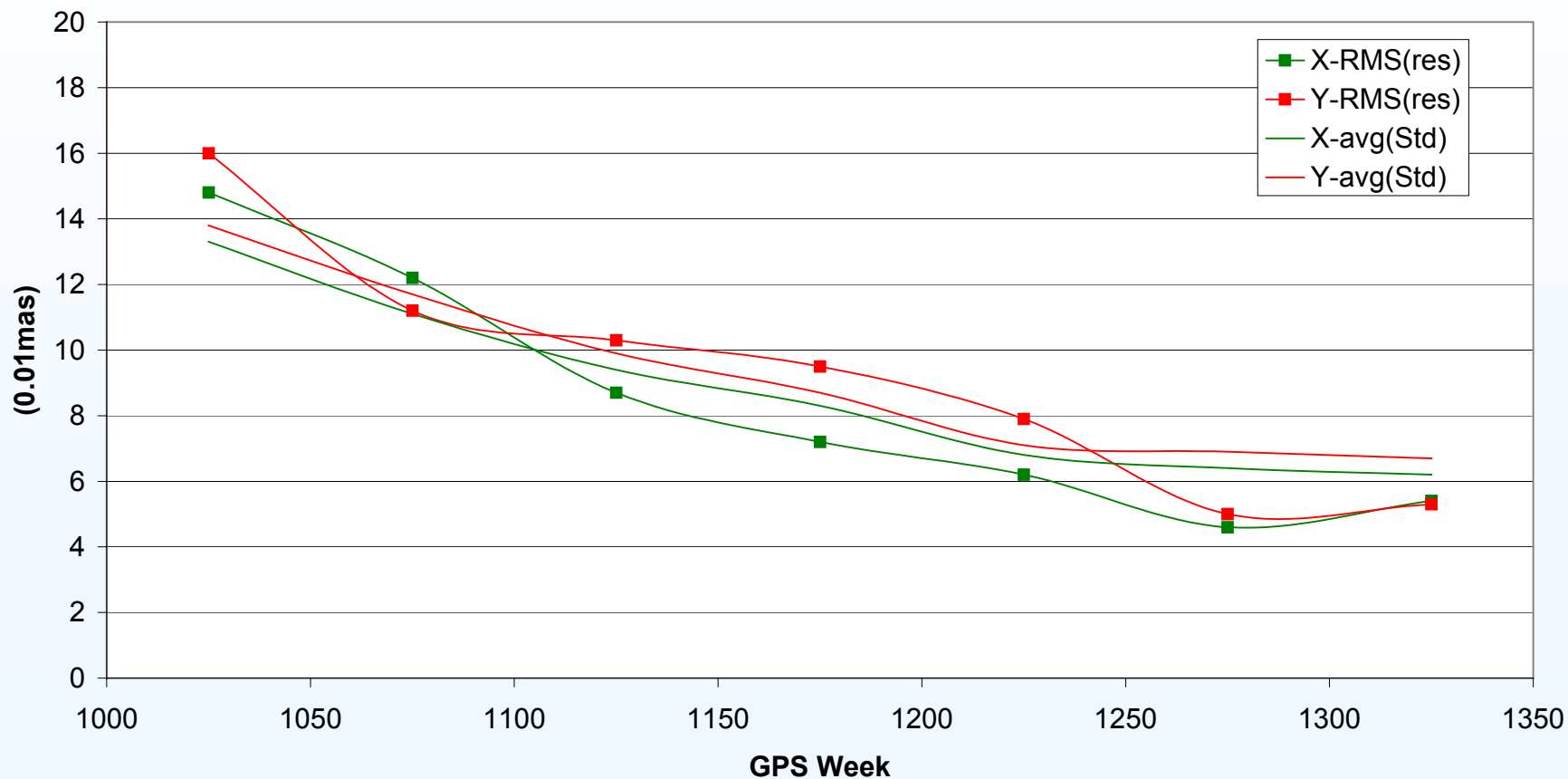
RMS

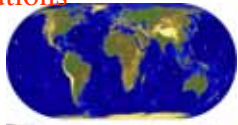
cod	7.6
emr	11.5
esa	11.6
gfz	5.2
jpl	4.8
MIT	5.2
ngs	21.8
sio	10.2
ALL	11.4
-(ngs)	8.8



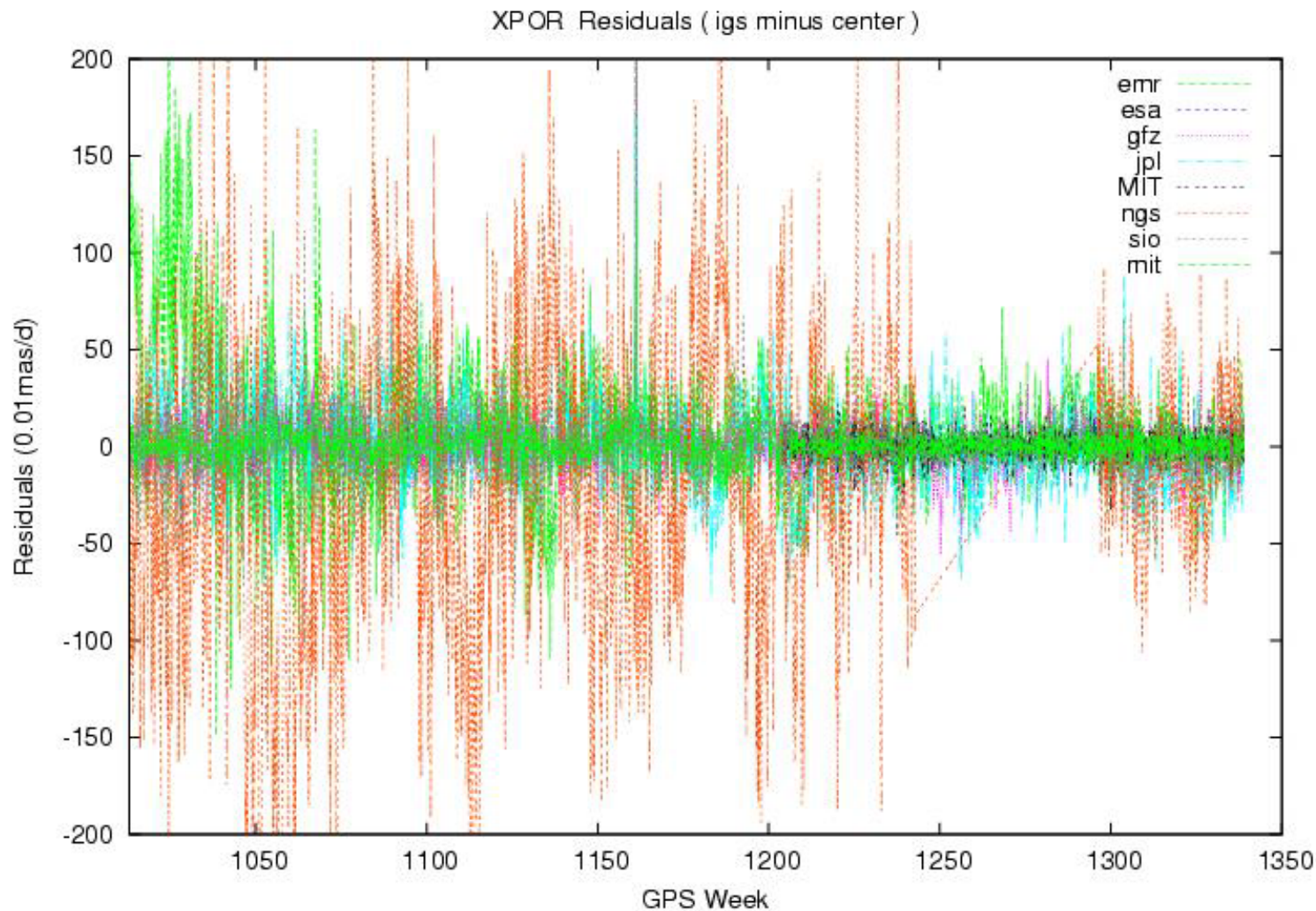
ACs Pole Position Precision Evolution

ACs Residuals Pole Position RMS & Average Standard Deviation





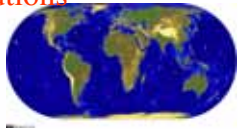
X Pole Rate Residuals



RMS

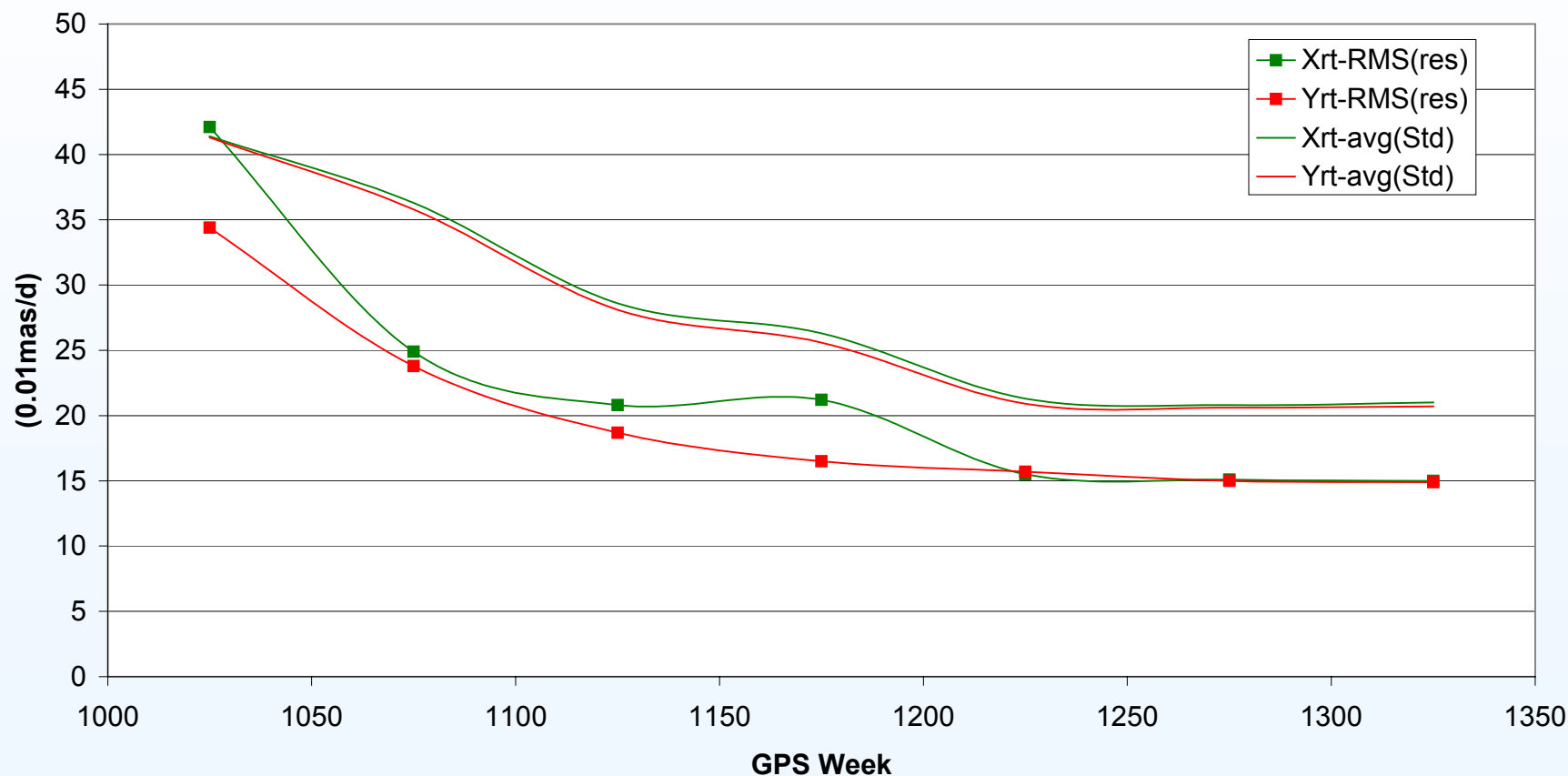
cod	-
emr	36.1
esa	16.8
gfz	13.6
jpl	22.8
MIT	8.1
ngs	79.2
sio	13.3
ALL	37.7
-(ngs)	22.4

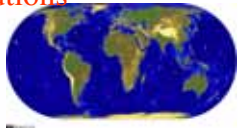




ACs Pole Rate Precision Evolution

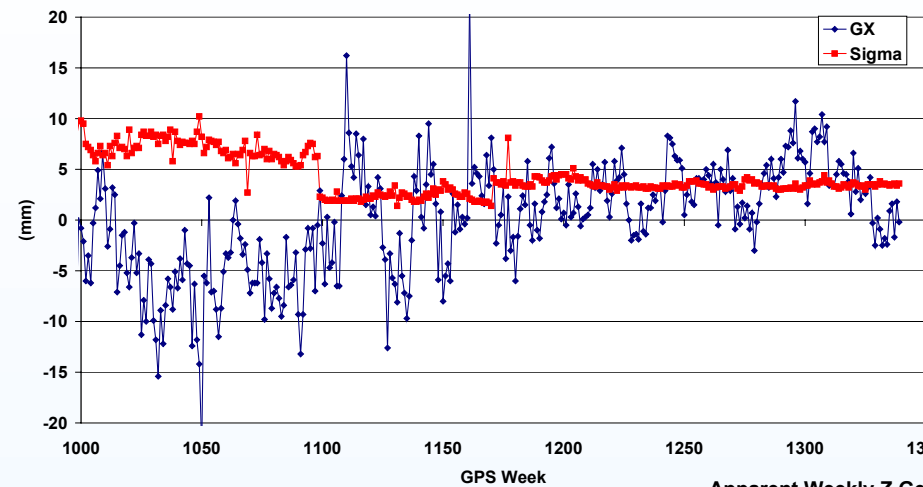
ACs Residuals Pole Rate RMS & Average Standard Deviation



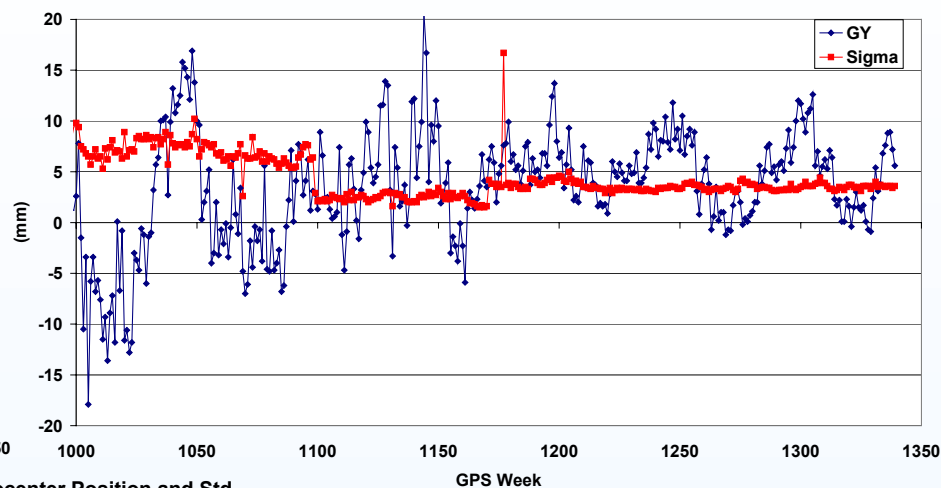


Apparent Geocenter

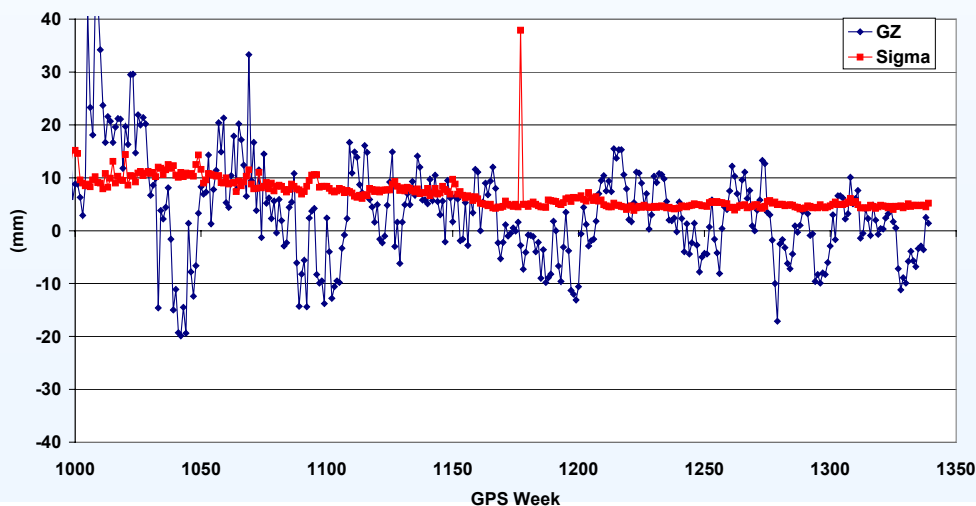
Apparent Weekly X Geocenter Position and Std.



Apparent Weekly Y Geocenter Position and Std.



Apparent Weekly Z Geocenter Position and Std.



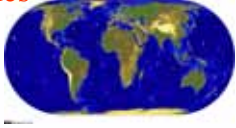
Aligned to
ITRF2000



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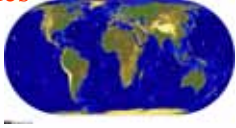
Canada



2. Discontinuity Tables

- Sources
- Criteria
- Inventory

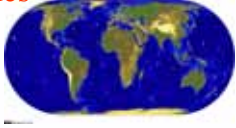




Sources of Information

- IGS (weekly)
- SIO (daily coordinates + discontinuities)
- JPL (daily coordinates + discontinuities)
- MIT (weekly) (cod + gfz + jpl + sio+ igs)
- Station Logs (IGSCB)
- USGS Earthquake Hazards Program
- Regional (EUREF & NAREF)
- Feedback from IGN & DGFI
- Others...

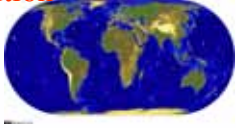




Criteria

- Inventory of complete time series available
- Event present in multiple time series
 - Independent interpretation
- Correlation with Auxiliary Information
 - Geophysical Event
 - Equipment Change
 - Local Perturbation
- Some subjectivity in the interpretation

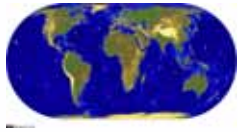




3. Cumulative Solution

- Objectives
 - (IGS) Consistency with discontinuity table
 - (IERS) Provide an independent solution for comparison
- Contents
 - Station coordinates & velocity
 - Loosely constrained
- Comparisons

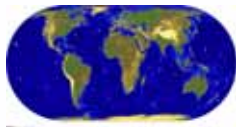




4. Reprocessing Activities

- Objectives
- Working Group
- Issues

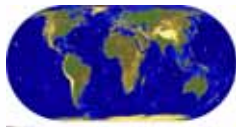




Objectives

- Produce the best possible products for the scientific and general user community
- Verify & Use best models
 - Software Upgrade
- Improved documentation:
 - Station logs
 - Processing
- Use More complete data sets

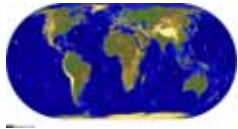




Working Group

- Headed By : Peng Fang (SIO)
- Proposed Membership:
 - 1 per AC's
 - ACC
 - 1 per Combination Products
 - Others...

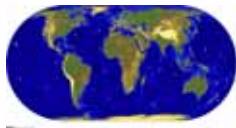




Issues (1/2)

- Station Inventory & Selection
- GLONASS ???
- Measurements Sampling Interval (30-300sec.)
- Requirements (Users)
 - Adherence to Convention (IERS)
 - Stations/Satellite - Antenna Absolute Phase Center
 - Troposphere (Azimuth Dependant/Numerical Weather Models)
 - Improved Orbit Models
 - Ionosphere (2nd order)
 - Etc...

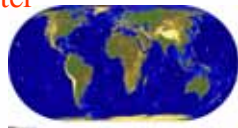




Issues (2/2)

- Products
 - Orbits / Coordinates / Clock / ERP's / Tropo. / Iono.
 - Apriori info.
 - Estimation Interval
- Analysis Centers / Products Centers / Combination Centers
 - Convention Models Compliance
 - Standardization of reporting
 - Overlapping sub-networks

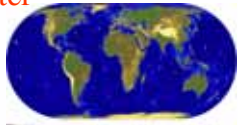




5. Relative to Absolute Phase Center

- Relative Calibration (w.r.t. AOAD/M_T=0.0)
 - Deficient for long baselines
 - Only elevation dependant effects
 - Satellite “Absolute” Phase Center cannot be properly accounted for
 - Introduces a scale bias
- Absolute Phase Center Calibration
 - Anechoic chamber
 - In the field using Robots (Geo++)
 - Elevation and Azimuth dependent
 - Include Satellites (Estimated)
 - Other antennas derived from relative calibrations.

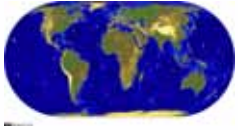




Consequences

- Discontinuity for all time series when switching to absolute phase center variations
- Scale change will absorb some of the observed position shift
- Will affect all IGS products users:
 - IERS
 - Regional & local users



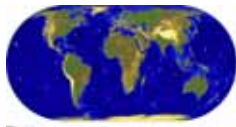


Relative/Absolute Phase Center Test

- Official solutions use “IGS_01” (Stations)
- Test Solutions use “IGS_T05” (Stations +Satellites)
- From GPS week 1325
- Participants: emr, gfz, mit, ngs, sio
- Average/Sigma effect (mm) (gfz&mit):

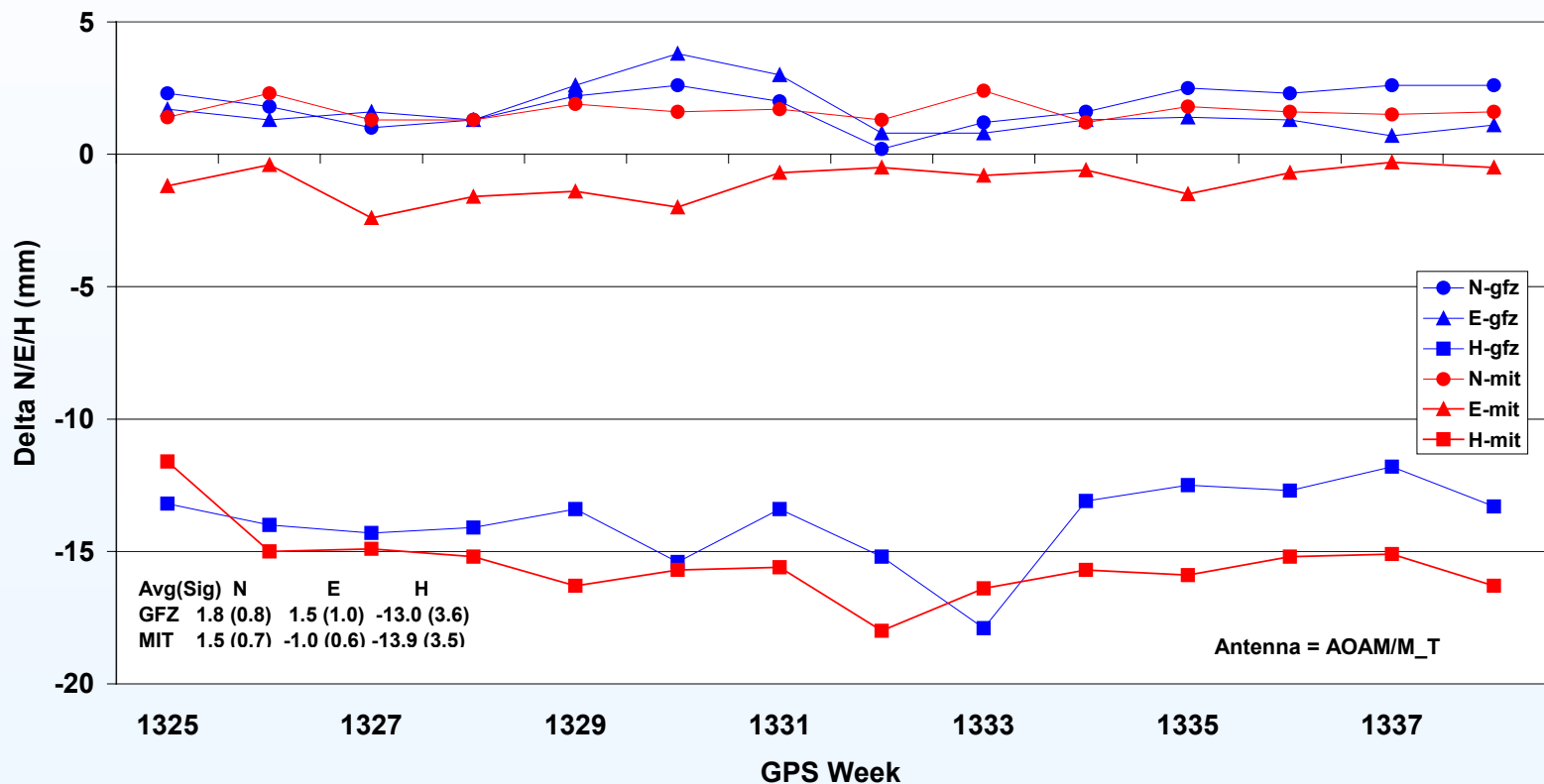
N	E	H
1.6 /1.7	0.0 / 2.2	-10.4 / 9.5

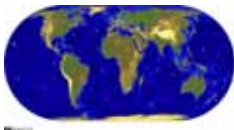




Effect of Calibration Change at ALGO

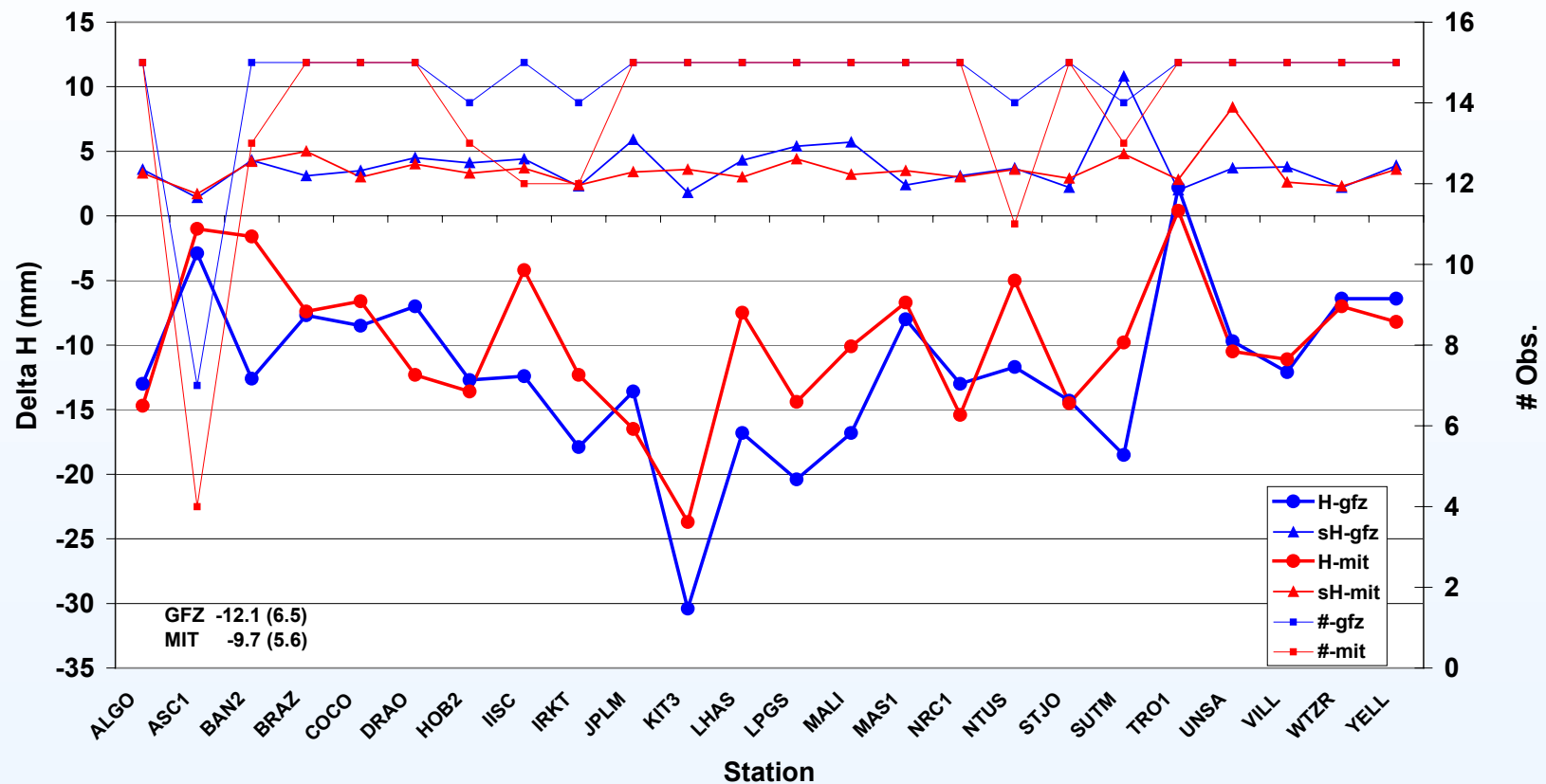
Antenna Calibration change (IGS_01 minus IGS_T05) at ALGO

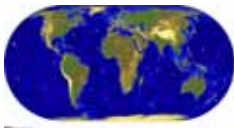




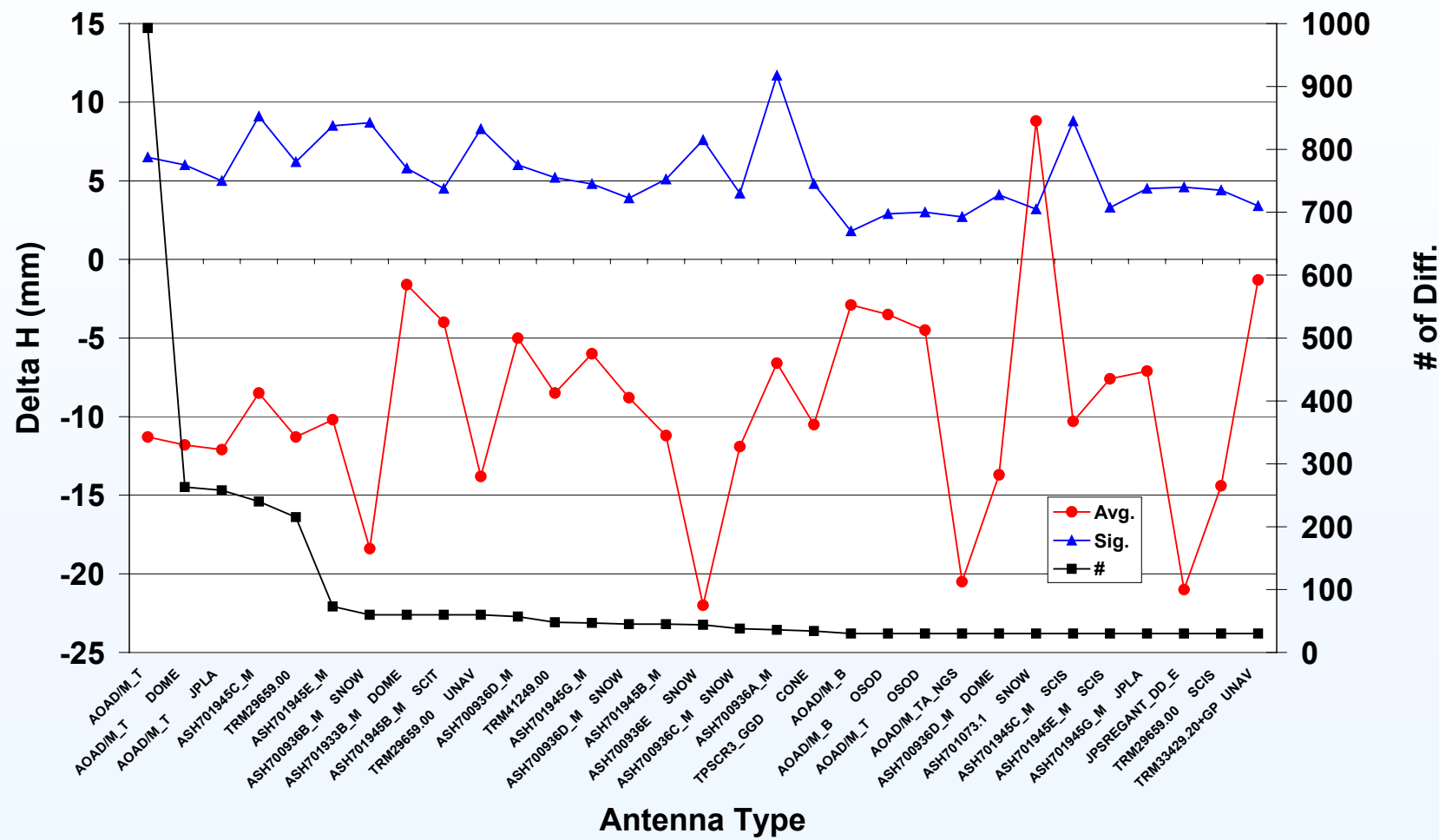
Case of Stations With AOAM/M_T

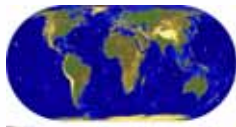
Effect of Antenna Calibration change (IGS_01 minus IGS_T05)
on height for stations with "AOAD/M_T" (GFZ & MIT)





Height Differences by Antenna Type

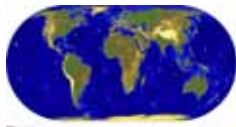




6. *Summary (1/2)*

- Products:
 - Stations
 - » 1996 → now
 - » (H&V) 10→2mm & 30→10mm
 - » 75 –250 (weekly)
 - ERP's
 - » 1999.5 → now
 - » 0.15 → 0.06 mas & 0.40 → 0.15mas/d
 - Apparent Geocenter
 - » 1999.5 → now
 - » XY & Z 9 → 4mm & 11 → 5mm





6. *Summary (2/2)*

- Discontinuities
 - Too many / Need Improvements
 - Some subjectivity
- Cumulative Solution
 - Consistent with Discontinuities
 - Used for comparison with IGN & DGFI
- Reprocessing
 - Important & demanding
 - Requires careful planning
- Antenna Calibration
 - Most IGS users may be affected

