

# Surveying, Mapping, and Geosciences Session

Giovanni Sella  
CORS Program Manager  
NOAA-National Geodetic Survey

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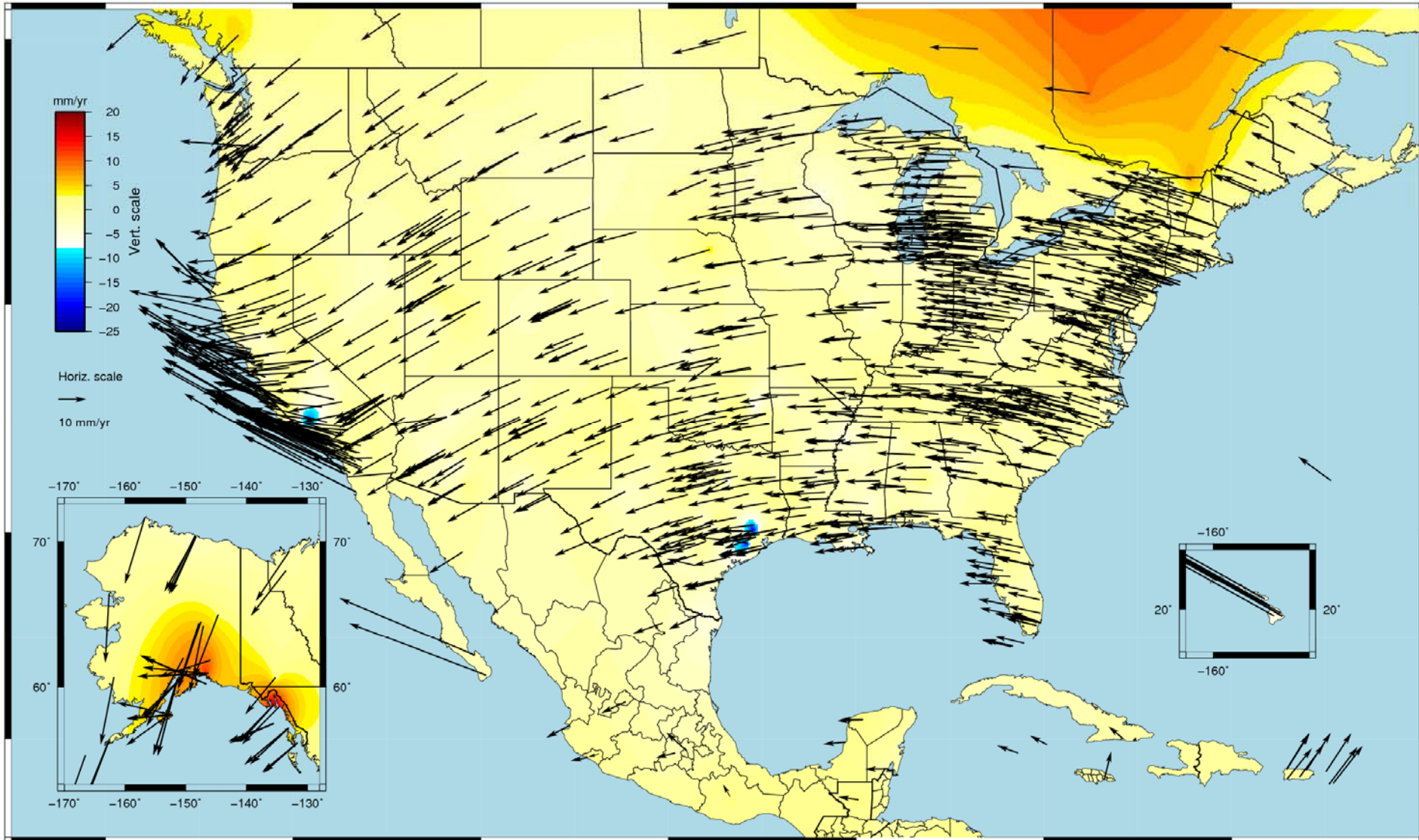
# CORS News for FY10-11

- New CORS coordinates released September 6
- New absolute antenna calibrations released
- Passive network adjustment in the works followed by new hybrid geoid
- Network grows to +1,800 stations
- OPUS supports two reference frames

# Reference Frames Used

- Basis is global frame inherited from ITRF2008 but not the same as ITRF2008
  - Name: **IGS08**
  - Epoch date: **2005.00** (same as ITRF2008, IGS08)
  - NGS has more discontinuities and weekly solutions than ITRF2008; and has applied IGS05\_ATX -> IGS08\_ATX corrections to be consistent with IGS08
- Related to ITRF, but plate fixed (NAD 83)
  - Name: **NAD 83(2011,MA11,PA11)**
  - Epoch date: **2010.00**
  - NAD 83(CORS96,MARP00,PACP00) to NAD 83(2011,MA11,PA11) identity transformation (i.e. same axes)
  - NAD 83(2011) axes origin different (~2m) from ITRF/IGS08 (expect reconciliation ~2022)

# CORS IGS08 Velocity Field



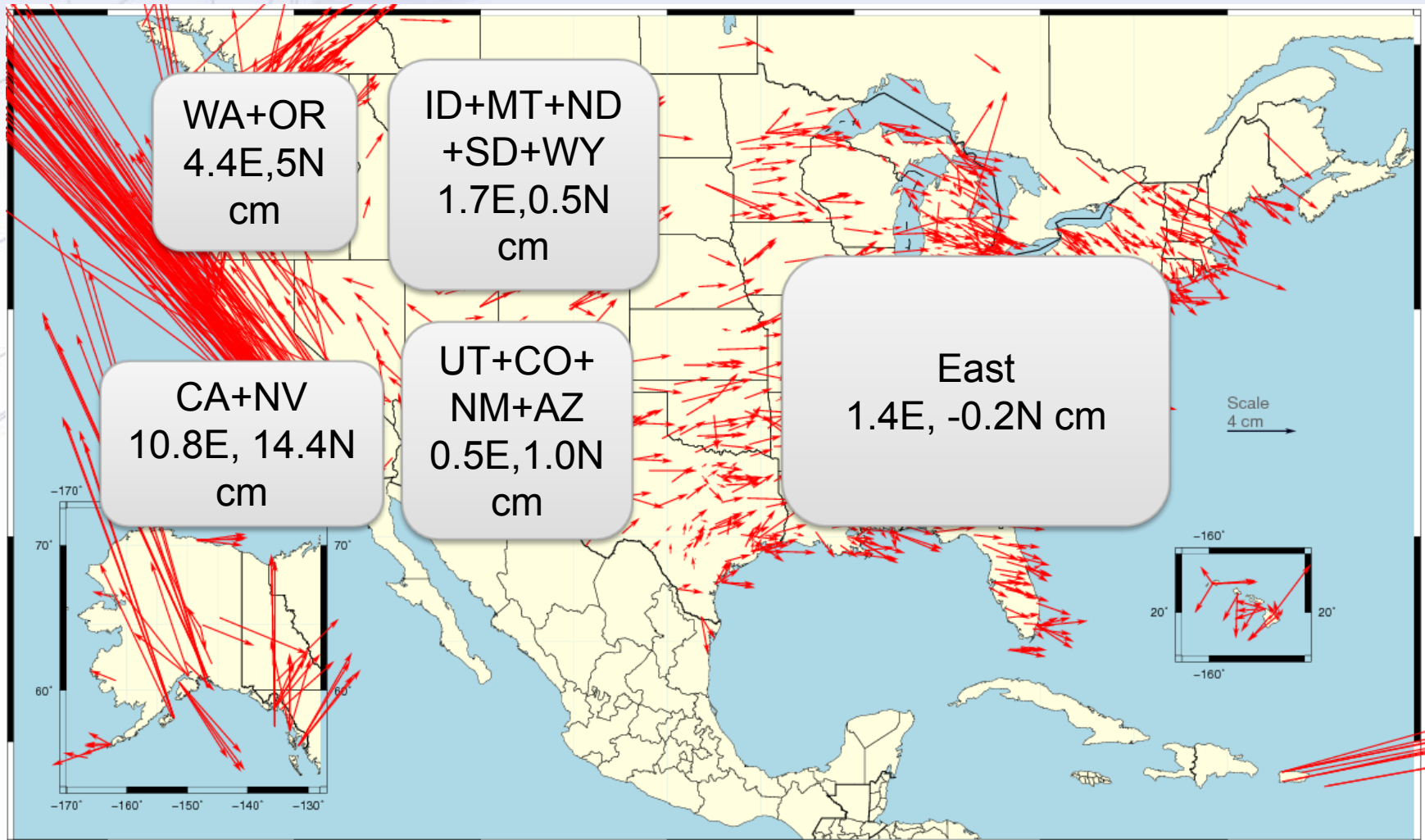
# The NAD 83 Datum Has Not Changed

- Same datum, so no transformation between NAD 83(CORS96,MARP00,PACP00) epoch 2002.00 and NAD 83(2011,MA11,PA11) epoch 2010.00
- **BUT** reference epoch has changed from 2002.00 to 2010.00
  - velocities are therefore critical
- Let's compare NAD 83(2011) positions @ 2010.00 to NAD 83(CORS96) positions @ 2002.00
  - differences dominated by effects of crustal motion, i.e., NAD 83 velocities are non-zero
  - **e.g. 2 mm/yr velocity after 8 years = 1.6 cm change in position**

# Changes in *Horizontal* NAD 83 Positions Different Epochs

NAD 83(2011) epoch 2010.0 – NAD 83(CORS96) epoch 2002.0

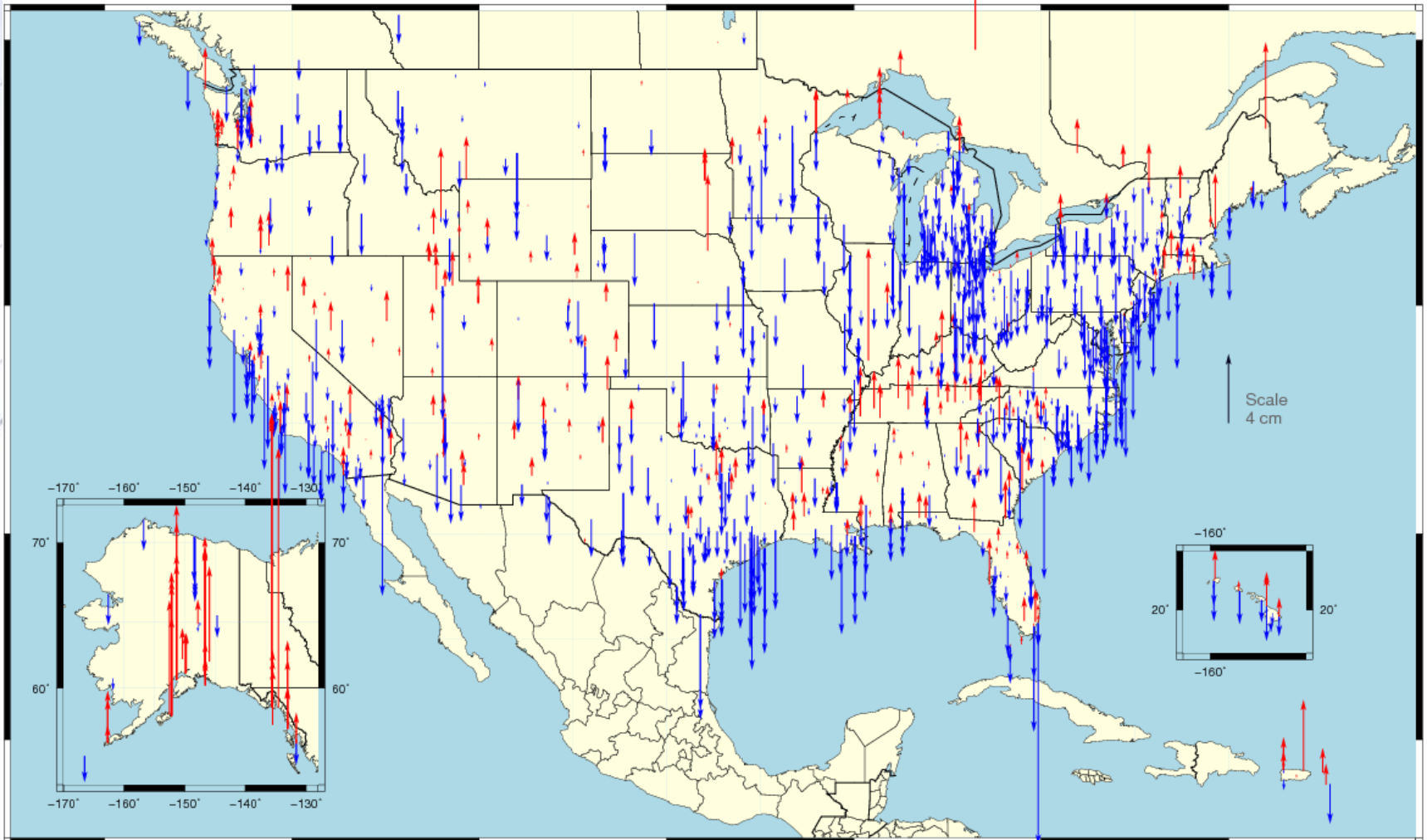
- Avg. shifts:  $\Delta E = 0.05 \pm 5.25$  (ME -0.12) cm  $\Delta N = 2.12 \pm 6.08$  (ME 0.00) cm
  - combination of position and velocity differences
  - due mostly to updated velocities (including up to 8 more years of data)



# Changes in *Vertical* NAD 83 Positions Different Epochs

NAD 83(2011) epoch 2010.0 – NAD 83(CORS96) epoch 2002.0

- Avg. shifts:  $\Delta U = -0.66 \pm 2.24$  (ME -0.80) cm
  - combination of position and velocity differences from additional data, tectonics
  - assuming vertical velocity  $\approx 0.00$  in NAD 83(CORS96)



# Changes with New Frames

- Change from relative to IGS08 absolute antenna phase center values (PCV)
- The global frame (IGS08) pos/vel are aligned to full global frame >100 sites
- Change in epoch from 2002.00 to 2010.00 in NAD 83(2011/MA11/PA11)
- No longer support coordinates in ITRF00 or NAD 83 (CORS96,MARP00,PACP00)
- What amount of change/tolerance are permitted?
  - No change 2 cm horizontal, 4 cm vertical



# Antenna Calibrations

National Geodetic Survey - Antenna Calibrations

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http://www.ngs.noaa.gov/ANTCAL/

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## Antenna Calibrations

National Geodetic Survey

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### Individual Absolute Calibrations

- 3SNAVIGATION
- ALTUS Positioning Systems
- AeroAntenna
- Allen Osborne Associates
- Antcom Corporation
- Ashtech
- DataGrid International
- Gutec AB
- Hemisphere GPS
- Javad
- Leica
- Macrometer
- Magellan Professional
- Micro Pulse
- NavCom
- NavXperience
- NovAtel
- Sensor Systems
- Septentrio Satellite Navigation
- Sokkia
- Spectra Precision
- Stonex
- Topcon
- Trimble

This page lists NGS's Antenna Calibrations.

Absolute Antenna Calibrations values are now the default values on this page and appear on all the antenna specific pages. These Absolute values should be used when processing data with CORS coordinates in IGS08 epoch 2005.00 and NAD 83(2011,MA11,PA11) epoch 2010.00 coordinates. These calibrations are different from earlier NGS calibrations that were relative antenna calibrations. For more information on the new CORS coordinates see: <http://geodesy.noaa.gov/CORS/coords.shtml>

If you are processing data with old CORS coordinates in ITRF00 epoch 1997.00 and NAD 83(CORS96, PACP00, MARP00) epoch 2002.00 you should use the Relative Antenna Calibrations available at the bottom of this page in table format only.

Please consult the FAQ on the left which contains additional information on the use of Absolute vs Relative Antenna Calibrations.

Do you have a suggestion/comment/question about this page please [email](#).

### Composite Absolute Calibrations

- ANTEX (new IGS format)
- ANTINFO (old NGS format)

### Composite Relative Calibrations

- ANTINFO (old NGS format)

### References

- ANTEX format information
- ANTINFO format information

#### Links

[ANTCAL Home](#)[FAQ](#)

# Passive Network and Geoid

- National Adjustment of 2011 (NA2011)
  - New adjustment of GPS passive control
  - GPS vectors tied (and constrained) to new CORS NAD 83(2011/MA11/PA11) epoch 2010.00
  - Approximately 80,000 stations and more than 400,000 GPS vectors
- Goal: Complete by end of 2011/early 2012
- New hybrid geoid model (GEOID12)
  - Use NAD 83(2011) epoch 2010.00 ellipsoid heights on NAVD 88 benchmarks
  - Might also use OPUS-Database results on NAVD 88 benchmarks
- Available after passive adjustment is completed

# OPUS

- User can choose to get results in either old or new frames
  - Old frame available till passive adjustment is completed

OPUS: the Online Positioning User Service, process your GNSS data in the National Spatial Reference System

OPUS: the Online Positioning Us... +

http://www.ngs.noaa.gov/OPUS/

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**OPUS: Online Positioning User Service**  
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On September 6, 2011 NGS's CORS group released **revised coordinates** for all CORS sites. The new coordinates update both the global frame and the National Spatial Reference Frame as follows.

	<u>New Frames</u>		<u>Previous Frames</u>
IGS08	Epoch 2005.00	ITRF00	Epoch 1997.00
NAD 83(2011)	Epoch 2010.00	NAD 83(CORS96)	Epoch 2002.00
NAD 83(MA11)	Epoch 2010.00	NAD 83(MARP00)	Epoch 2002.00
NAD 83(PA11)	Epoch 2010.00	NAD 83(PACP00)	Epoch 2002.00

NGS is in the process of completing an **adjustment of the passive control network**. Until the adjustment is complete, OPUS will allow users to choose getting coordinates in either the new or previous reference frames. Once the passive network is adjusted to NAD 83(2011, MA11, PA11) then the OPUS support for ITRF00 and NAD 83(CORS96, MARP00, PACP00) will end.

Choose one of the following buttons to upload your data.

NAD 83(2011,MA11,PA11)  
epoch 2010.00

IGS08

NAD 83(CORS96,MARP00,PACP00)  
epoch 2002.00

ITRF00

- **Q:** Which button/reference frame should I choose to get my solution?
  - **A:** Most users should start using the new reference frame, especially for users who are only interested in the global reference frame i.e. IGS08. Users who are in the middle of a project, will probably want to continue using their original reference frame.
- **Q:** How much will OPUS coordinates change if I use the new reference frame?
  - **A:** The biggest changes in the coordinates are caused by the change from relative to absolute antenna calibrations and the change in reference epoch as defined at the top of this page. OPUS coordinate changes should mimic those of the CORS namely: Difference of NAD 83(2011) epoch 2010.00 minus NAD 83(CORS96) epoch 2002.00; mean East 0.05+5.25 cm;

# Summary

- Users must use appropriate antenna calibrations with particular reference frames
- All NGS Products and Services will be in consistent frames in 2012:
  - IGS08 epoch 2005.00
  - NAD 83(2011,MA11,PA11) epoch 2010.00
- Adjusted passive network in the works followed by new geoid
- User should start thinking that transforming between frames is problematic need to plan to reprocess with new frames
- We recognize that NGS and the public want CORS to be the primary access to the NSRS, but **accuracy and constancy are not always possible**