Surveying, Mapping, and Geosciences Session

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CGSIC - Portland, OR
19 September, 2011
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)
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

Individual Absolute Calibrations

- 3SNAVIGATION
- ALTUS Positioning Systems
- AeroAntenna
- Allen Osborne Associates
- Antcom Corporation
- Anttech
- DataGrid International
- Gutec AB
- Hemisphere GPS
- Javad
- Leica
- Macrometer
- Magellan Professional
- Micro Pulse
- NavCom
- NavXperience
- NovAtel
- Sensor Systems
- Septentrio Satellite Navigation
- Sokkia
- Spectra Precision
- Stnax
- 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
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
• User can choose to get results in either old or new frames
  - Old frame available till passive adjustment is completed
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