Surveying, Mapping, and Geosciences Session

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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 hydrid 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
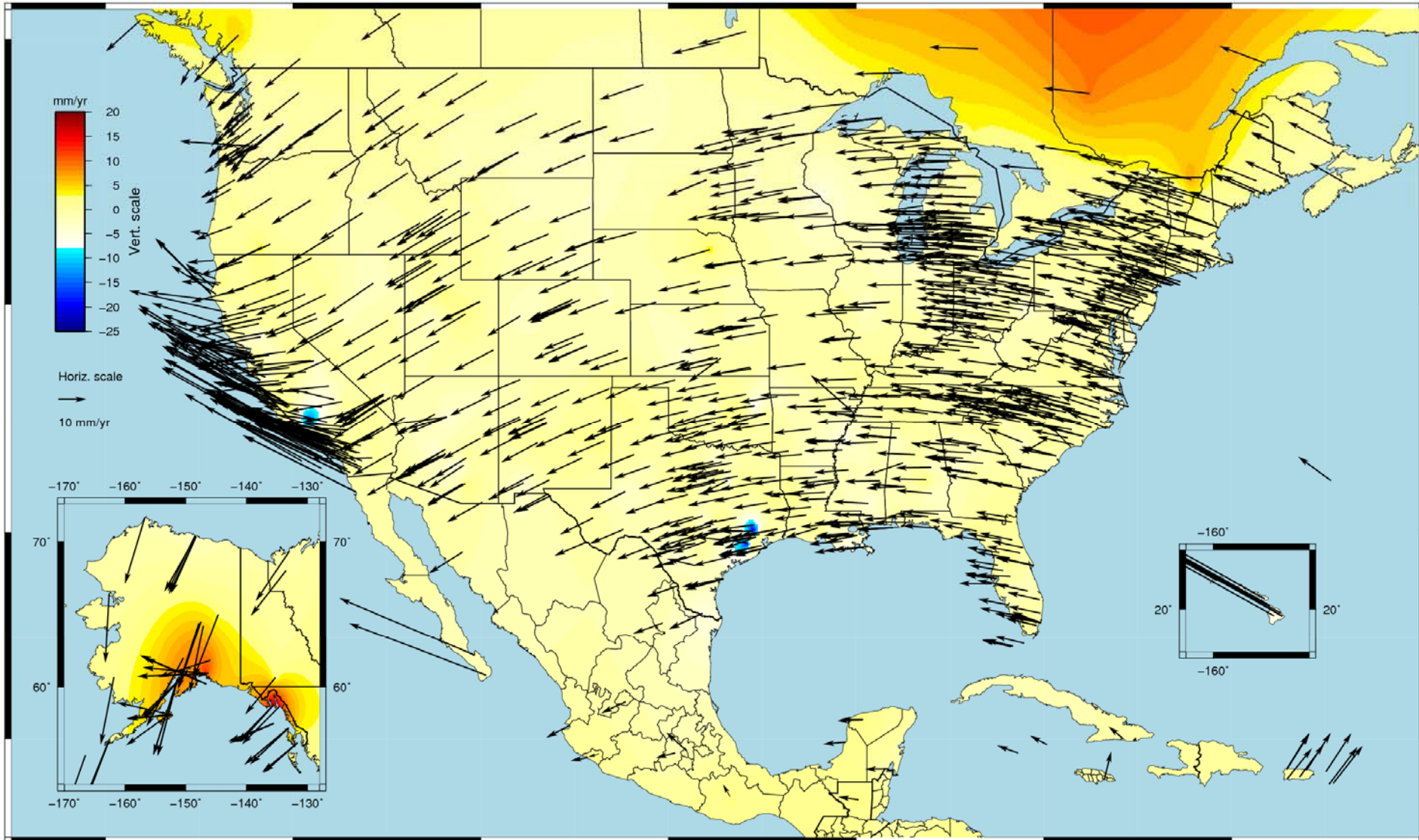
The NAD 83 Datum Has Not Changed

- 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

- 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)
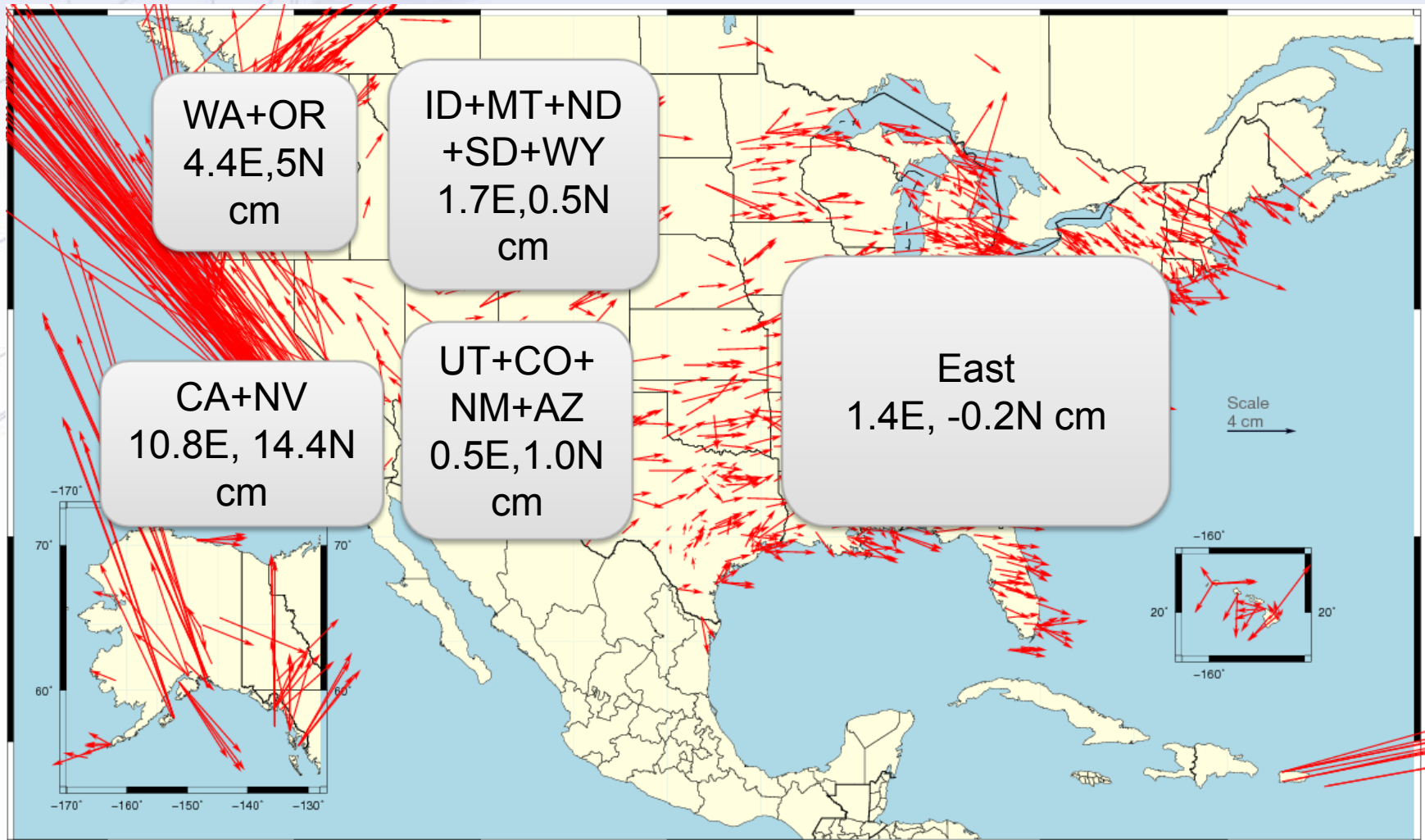
Changes in *Vertical* NAD 83 Positions Different Epochs

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 ≈ 0.00 in NAD 83(CORS96)
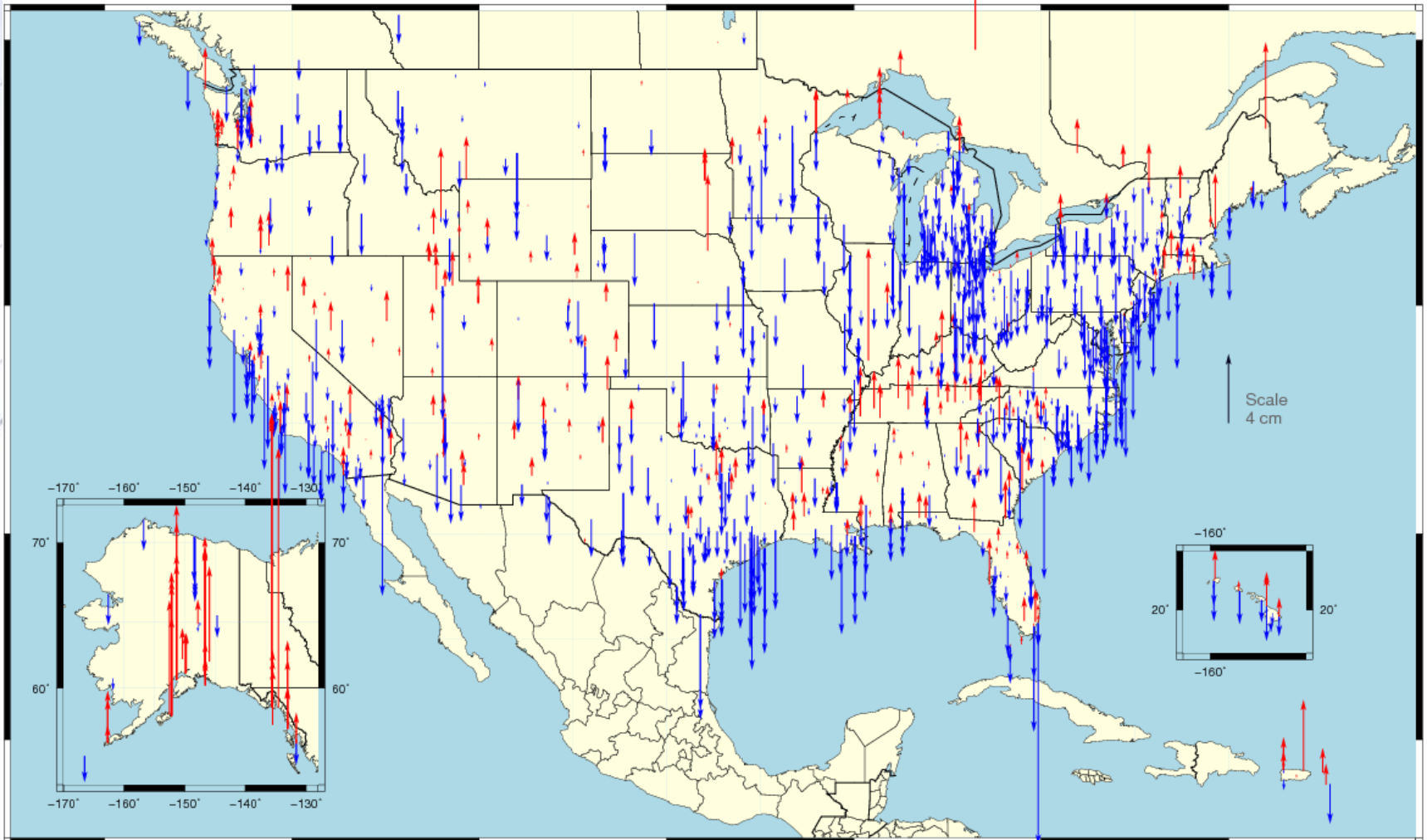
Changes with New Frames

- 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

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

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