

# Surveying, Mapping, and Geosciences Session or CORS User Form

Giovanni Sella (Chair) & Bill Henning (deputy)

- Program
- Giovanni Sella & Jake Griffiths: **CORS updates esp. changes to coord/vels at CORS sites**
- Andria Bilich: **Absolute Antenna Calibrations**
- Bill Henning: **NGS Real-Time activities**
- Save questions for after Bill's talk
- Split up into 4 groups:  
Coord/Vel Changes, Ant. Calib., Realtime, OPUS

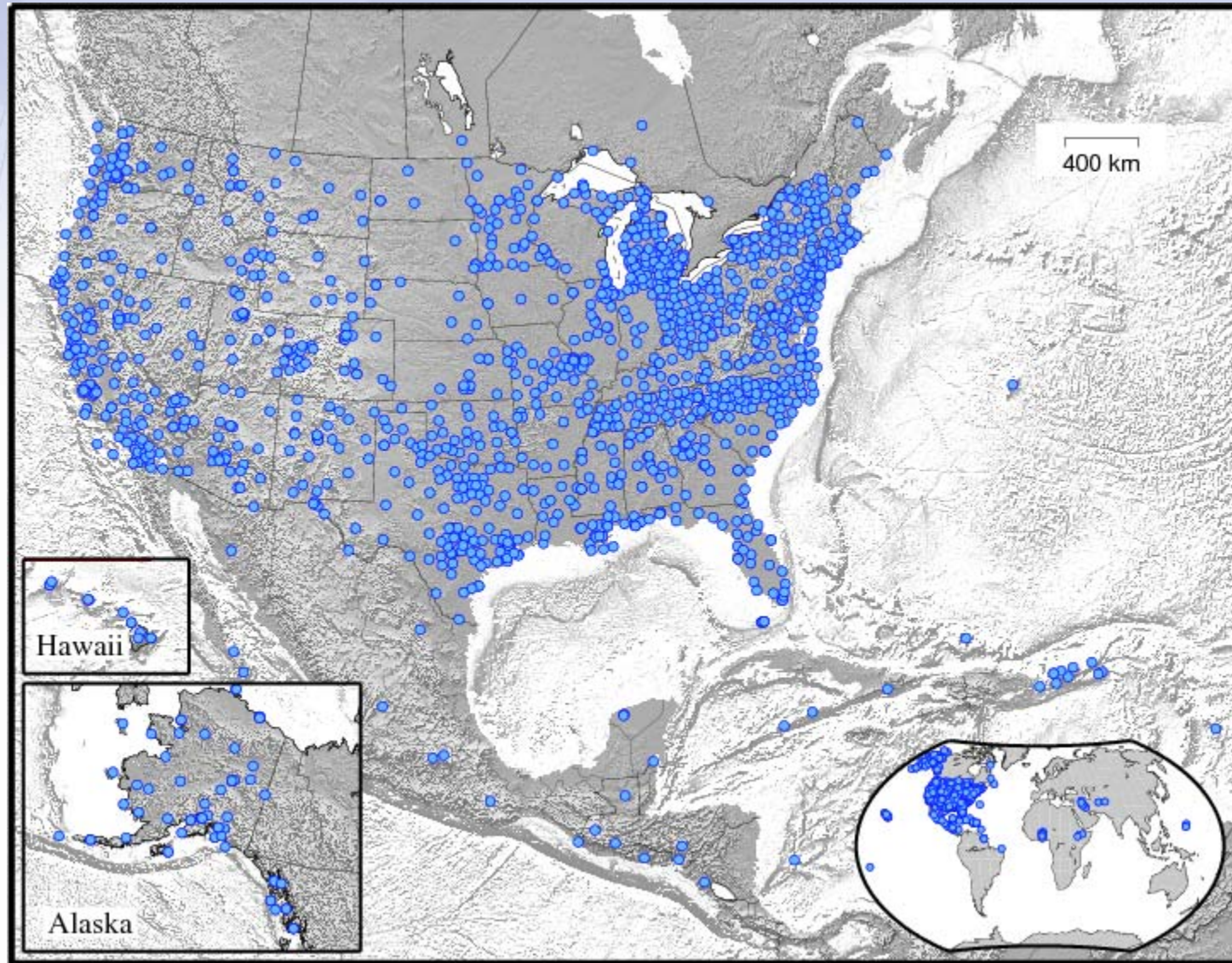
# CORS Program: Updates to Products and Services especially

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20 September 2010

# CORS Network September 2010

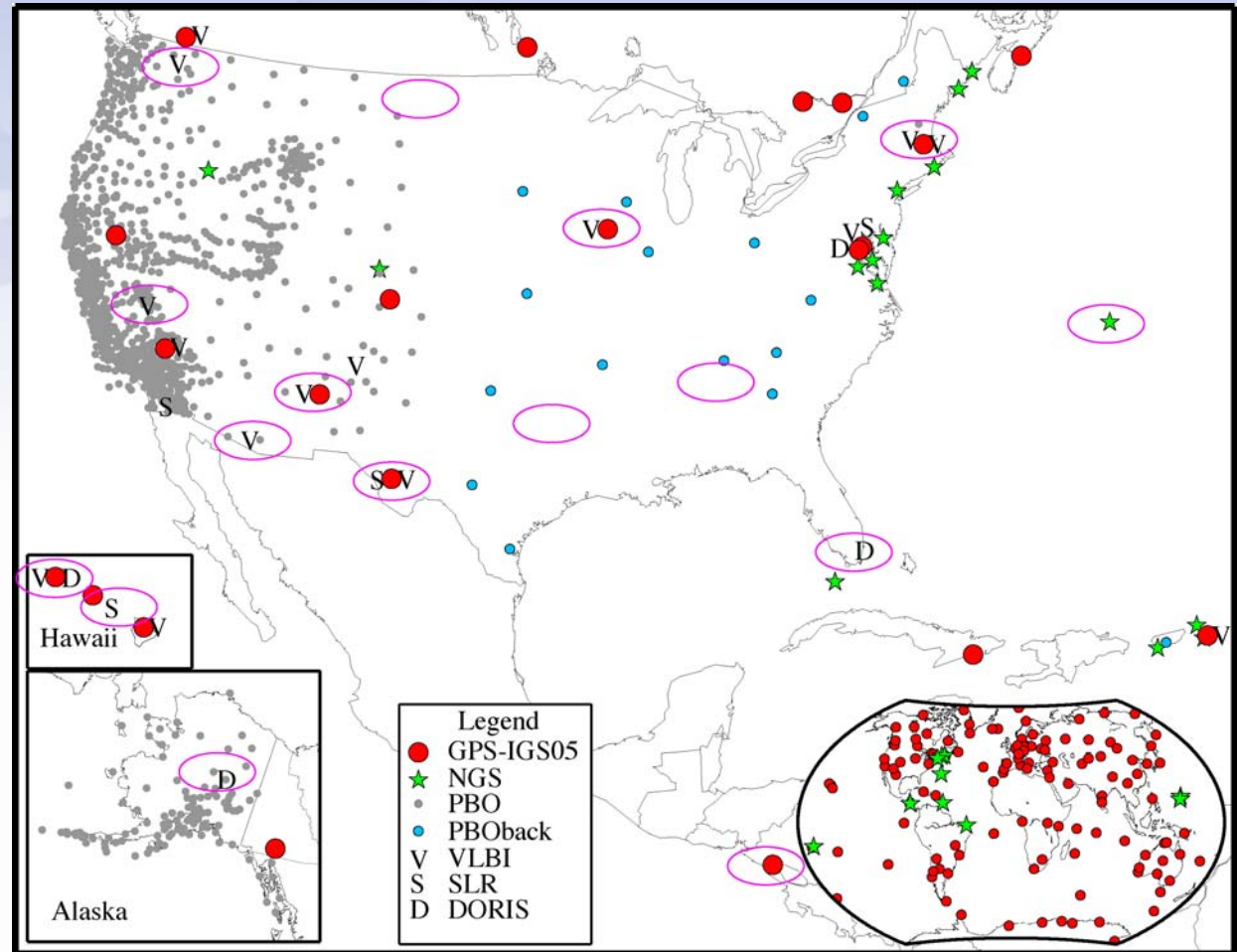
- Active sites  
1500+
- Added  
223
- Proposed  
106





# Foundation CORS

- Link to ITRF at sites co-located with VLBI, SLR, DORIS, then geographic gaps
- Most **IGS05 sites in NoAm** need new monuments
- ~10 in CONUS + AK, HW and US terr. Limited international
- Drilled braced monuments
- Time-line: ~2 sites/year start FY10-11



Possible sites  
magenta ovals

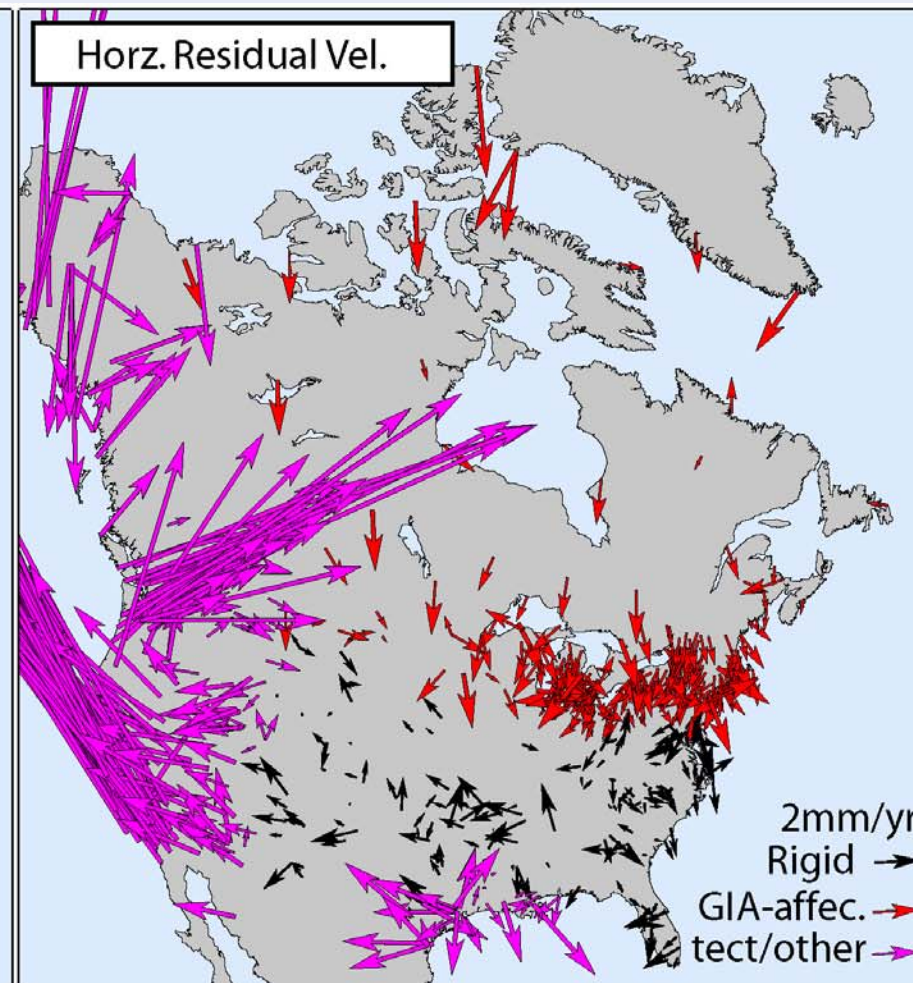
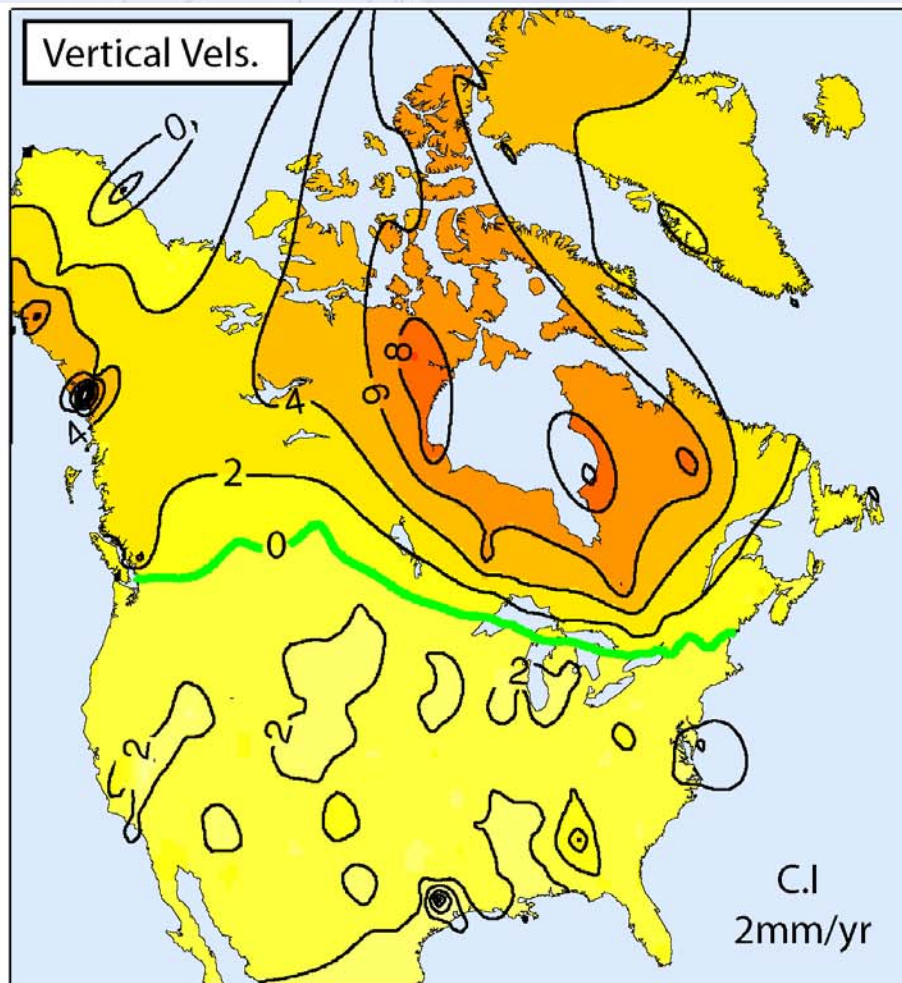
## Other Products

- New CORS web site available
- GLONASS and GPS data available in main online storage by the end of this calendar year. UFCORS 4.0 will support GNSS. Beta very soon.
- HTDP for Alaska preliminary available early next year, major update end of next year
- GLONASS processing at NGS delayed early 2011
- OPUS-DB available, OPUS-Projects. Beta very soon
- Real Time (hear Bill Henning talk)

# Coordinates and Velocities they move!

Preliminary CORS Multiyear soln.

Plate fixed





# Current CORS Coord. and Vel.

- Mixed coordinates and velocities from: last reprocessing (1994-2002), and adjustments using 8-3 ITRF sites
- Mixed HTDP vs. computed vel.; Vertical vel. = 0 mm/yr
- NGS's current global frame is ITRF2000 epoch 1997.0 projecting 13 yrs is unrealistic; NAD 83(CORS96) epoch 2002.0 projecting 8 yrs becoming a problem
- Metadata issues, discontinuities/offsets
- Significant software changes
- Absolute vs relative antenna phase center values
- **Need to revise CORS coordinates and velocities**

# Solution: “multiyear”

- “Multiyear” effort began 5 years ago
- Began with a revision of PAGES and processing strategy driven by weak NGS orbit contribution to IGS.
- IGS proposed re-processing all data to re-compute station coordinates, orbits and EOPs from 1994-present
- **Richard Snay** provided resources and managed the effort of the “multiyear” effort till May 2010.
- Team: K. Choi, M. Cline, B. Dillinger, B. Dulaney, J. Griffiths, S. Hilla, B. Kass, J. Ray, J. Rohde, G. Sella, R. Snay, T. Soler, M. Schenewerk, and G. Ray



# Frame Definition and Nomenclature

- ITRF frame (global and most accurate) multi-technique
- NAD frame (plate fixed frame) tied to ITRF
- **Critical** to pay attention to frame **tags and epoch dates**

Frame Name	Epoch	Antenna PCV*	Data Duration
ITRF2000	1997.0	Rel ANTEX	1994.0-2002.0
NAD 83(CORS96)	2002.0	Rel NGS ANTEX	1994.0-2010.5
ITRF2008	2005.0	Abs IGS05 ANTEX	1997.0-2009.5
MYCS_P (only prelim)	2005.0	Abs IGS05 ANTEX	1994.0-2010.5
IGS08	2005.0	Abs IGS08 ANTEX	1997.0-2009.5
NGSTRF08 (tentative)	2005.0	Abs IGS08 ANTEX	1994.0-2010.5
NAD 83(CORS96A) (tentative)	2010.0	Abs IGS08 ANTEX	1994.0-2010.5

\*PCV – phase center value; Abs-Absolute, Rel-Relative

Jake Griffiths will now describe our  
reprocessing strategy and the  
results for CORS

# Done and To Do

- **Fall 2005:** First discussion and start of software overhaul
- **Spring 2008:** Start of re-analysis of orbits and CORS data
- **Feb 2009:** First results <http://beta.ngs.noaa.gov/myear>
- **Feb 2010:** NGS submits final solution to IERS
- **Apr 2010:** Full solution and frame discussion begin
- **May 2010:** IERS publishes ITRF2008
- **Jun-Aug:** Verification of time-series for discontinuities
- **Sep-Oct:** Test/revise new coordinates. Update web page
- **Oct:** Incorporate IGS08 absolute antenna PCVs
- **Nov-Dec:** coord./vels. beta site, feedback 😊😞, modify?
- **Jan-Feb:** Publish and integrate coord/vel into all prods.

# Key Changes

- Change from relative to absolute antenna phase center values (hear talk by Andria Bilich)
- NGS global frame coord/vels will be aligned to full global frame (NGSTRF08)
- Distinction between computed and modeled velocities must be maintained and ***emphasized*** to users
- Ability to robustly/consistently re-compute coord/vels
- Robust discontinuity identification and resolve metadata issues quickly
- Fixed plate coord/vel (NAD 83) change epoch from 2002.0 to 2010.0



# Transition Multiyear to Operations

- Multiyear processing method will become operational method, old method stops
- 2 sets of processing:
  - Fast next day, to produce 60 day plots and catch meta-data errors, aligned to same frame (not stacked) so noisier
  - Slow ~24-30 days later final solution (metadata issues resolved), stacked weekly solutions, used to define coordinates and velocities

# Reference Frames Used

- Base is global aligned to ITRF:
  - NGS has more solutions than ITRF2008 and will be aligned to IGS08 with IGS08 PCV file (ANTEX)
  - Tentative name **NGSTRF08**
  - Epoch date **2005.0** (same as ITRF2008, IGS08)
- Related to ITRF, but plate fixed (NAD 83)
  - NAD 83(CORS96) to NAD 83(CORS96A) is identity transformation (i.e. same axes)
  - Tentative name **NAD 83(CORS96A)**
  - Epoch date **2010.0**
  - NAD 83(CORS96) will **not** be geocentric (expect 2018)

# Changes with New Frame

- No longer treat all CORS as equal due to non-linear motion and use of “fixed coordinates”
- Identify subset of CORS that can have coordinates held fixed: **Linear velocities, small annual amplitude**
- Other sites have coord. and vel., but not recommend to hold fixed (non-linear/large amp./modeled?)
- New CORS will have coordinates from stacked solution, but velocities via HTDP (i.e. modeled)
- Users encouraged **not** to use CORS with **modeled** velocities, until computed vels. are avail. (may take up to 3 yrs).

# Proposed Changes with New Frame

- CORS coords. and vels. will be revised every 3-6 months. If problem with site is identified, site flagged as problem e.g. Currently do not have an automated way to deal with earthquake offsets/velocity changes
- What amount of change/tolerance are permitted? Current is 2 cm horizontal, 4 cm vertical, should this be reduced to 1 cm and 2 cm?



# Questions/Comments

- We have a plan, but we don't know all the impacts
- We are looking for feedback
- 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**

Contact us

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