

**UNAVCO GAGE GNSS Data Product Notice to Users:  
Transition to NAM14/IGS14 Reference Frame and Release of Reprocessed Products**

**2019-09-04**

Prepared by:

Dr. Thomas A. Herring, GAGE GNSS Analysis Center Coordinator, MIT  
Dr. David A. Phillips, UNAVCO GNSS Data Products and Archives Project Manager

**Summary**

On September 1, 2019 (GPS week 2069, day 0) the GAGE GNSS analysis transition from ITRF2008 to ITRF2014 was completed. The new primary reference frame for GAGE data products is “NAM14” which is IGS14 rotated to the North America Plate (the previous primary frame was NAM08). To assist users with this transition, data products will be available in both NAM14/IGS14 and NAM08/IGS08 versions for several months. This reference frame change is accompanied by the release of the full set of reprocessed time series in NAM14/IGS14 for all analyzed stations back through 1996. The simultaneous change in operational processing and release of reprocessed products was planned to ensure that no artificial offsets were introduced into any time series due to the reference frame change.

This reference frame transition and release of reprocessed products is among the recent and planned changes to GAGE GNSS data analysis and products as summarized in the following document. We would also like to reemphasize that only data product files with “CWU” in the name include solutions after 2018-09-15 (GPS week 2019), also as summarized in the following document.

[https://www.unavco.org/data/gps-gnss/derived-products/docs/GNSS\\_Products\\_Update\\_20190612.pdf](https://www.unavco.org/data/gps-gnss/derived-products/docs/GNSS_Products_Update_20190612.pdf)

**Details**

The GAGE GNSS Analysis Center at Central Washington University and Analysis Center Coordinator at MIT generate post-processed derived data products for more than 2,000 stations from the UNAVCO operated Network of the Americas (NOTA, including sites from the networks formerly known as PBO, COCONet and TLALOCNet), NSF PI networks, and other local and regional networks.

Starting on September 1, 2019, GPS week 2069 day 0, GAGE GNSS analyses switched from the NAM08 reference frame (based on the ITRF2008 reference frame and plate motion model; Altamimi et al., 2011; Altamimi et al., 2012) to the NAM14 reference frame (based on the ITRF2014 reference frame and plate mode; Altamimi et al., 2016; Altamimi et al., 2017).

GAGE analyses have used the ITRF2014 system for processing since GPS week 2005 day 0, June 10, 2018 while the final frame alignment was to the NAM08 system of positions and velocities (Herring et al., 2016). The transition to ITRF2014, as realized by the IGS14 coordinates and velocities, are rotated to a North America fixed reference frame defined by the Euler pole for North America (NOAM, given in Table 1 for Altamimi et al., 2017). The NAM14 positions were aligned to the IGS14 positions on 2010.0. Other details about the transition are discussed in [http://www.unavco.org/data/gps-gnss/derived-products/docs/GAGE\\_IGS14\\_transition\\_update\\_20180626.pdf](http://www.unavco.org/data/gps-gnss/derived-products/docs/GAGE_IGS14_transition_update_20180626.pdf).

NOAM Euler pole from Table1 of Altamimi et al., 2017.

Plate	NS	$\omega_x$ (mas/yr)	$\omega_y$ (mas/yr)	$\omega_z$ (mas/yr)	$\omega$ (deg/a)	WRMS E (mm/yr)	WRMS N (mm/yr)
NOAM	72	0.024	-0.694	-0.063	0.194	0.23	0.28
		$\pm 0.002$	0.005	0.004	0.001		

The realization of the position and velocity field for the NAM14 system is described and discussed in [https://www.unavco.org/data/gps-gnss/derived-products/docs/GNSS\\_Products\\_Update\\_20190612.pdf](https://www.unavco.org/data/gps-gnss/derived-products/docs/GNSS_Products_Update_20190612.pdf)

SINEX files from the New Mexico Tech (NMT) GAMIT analyses and Central Washington University (CWU) GIPSY analyses were combined as described in the Velocity Release Notes above. The combined solutions include reprocessed results from NMT between 1996 and 2018/09/15. This combined solution forms the basis for the current NAM14 reference frame. Later this year, an updated SINEX based velocity field will be released based on the analysis of CWU only SINEX files.

### Product changes

*Time series files:* Position time series files in the NAM14 frame will become the standard GAGE GNSS time series product. IGS14 (no-net-rotation) time series files will be generated from these primary files. For the next few months, NAM08 and IGS08 time series will continue to be made available and will be generated by aligning the NAM14 time series with the NAM08 and IGS08 systems as used.

*SINEX files:* SINEX files for NMT, CWU and the combination (PBO) in the NAM14 system are available at UNAVCO for the period 1996/01/01 to 2018/09/15. After this end date and continuing forward, only NAM14 SINEX for the CWU analysis center will be available. The AC submitted SINEX files and the loose combined files are labeled as LSE14 to show the models used to generate the SINEX files are compatible with the IGS14/ITRF2014 models. NAM08 SINEX files will be discontinued after September 1, 2019 with only the NAM14 versions being made available.

### References

- Altamimi, Z., X. Collilieux, and L. Métivier (2011), ITRF2008: An improved solution of the international terrestrial reference frame, *J. Geod.*, 85, 457–473, doi:10.1007/s00190-011-0444-4.
- Altamimi, Z., L. Métivier, and X. Collilieux (2012), ITRF2008 plate motion model, *J. Geophys. Res.*, 117, B07402, doi:10.1029/2011JB008930.
- Altamimi, Zuheir, Paul Rebischung, Laurent Métivier, and Xavier Collilieux. 2016. "ITRF2014: A New Release of the International Terrestrial Reference Frame Modeling Nonlinear Station Motions." *Journal of Geophysical Research: Solid Earth* 121 (8): 6109–31. <https://doi.org/10.1002/2016JB013098>.
- Altamimi, Zuheir, Laurent Métivier, Paul Rebischung, Hélène Rouby, and Xavier Collilieux. 2017. "ITRF2014 Plate Motion Model." *Geophysical Journal International* 209 (3): 1906–12. <https://doi.org/10.1093/gji/ggx136>.
- Herring, T.A., T.I. Melbourne, M.H. Murray, M.A. Floyd, W.M. Szeliga, R.W. King, D.A. Phillips, C.M. Puskas, M. Santillan, and L. Wang. 2016. "Plate Boundary Observatory and Related Networks: GPS Data Analysis Methods and Geodetic Products." *Reviews of Geophysics* 54 (4). <https://doi.org/10.1002/2016RG000529>.