

Quarterly Report
Massachusetts Institute of Technology
GAGE Facility GPS Data Analysis Center Coordinator

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Period: 2024/04/01-2024/06/30

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Summary

Under the GAGE2 Facility Data Analysis sub-award, MIT has been processing SINEX files from Central Washington University (CWU) and aligning them to the GAGE NAM14 reference frame. In this report, we show analyses of the data processing for the period 2024/04/01 to 2024/06/30, as well as time series velocity field analyses for the GAGE reprocessing analyses (1996-2024). Several earthquakes were investigated this quarter up to 2024/06/15, and none of them generated any detectable co-seismic offsets.

Analysis files (pbo format velocity files and offset files) are generated monthly and sent via LDM in the middle of each month.

We continue to process ANET data. These solutions are in the ANT14 frame as defined in the ITRF2014 plate motion model [Altamimi *et al.*, 2017].

GPS Analysis of Level 2a and 2b products

Level 2a products: Rapid products

Final and rapid level 2a products have been, in general, generated routinely during this quarter for the CWU solutions. The description of these products, the delivery schedule, and the delivery list remain unchanged from the previous quarter and will not be reported here.

Level 2a products: Final products

The final products are generated weekly and are based on the final JPL orbits and clocks. Finals and rapid solutions are now being generated in the IGS14 system. In this quarter, 1977 stations were processed. In addition, up to 47 sites were processed in the ANET solutions, the same as last quarter. The number of stations processed fluctuated as data systems were updated at EarthScope.

Level 2a products: 12-week, 26-week supplement products

Each week, we also process the Supplemental (12-week latency) and six-month supplemental (26-week latency) analyses from CWU for the main GAGE2 Networks of the Americas stations (NOTA). The delivery schedule for these products is also unchanged.

Analysis of Final products: March 15, 2024– June 22, 2024

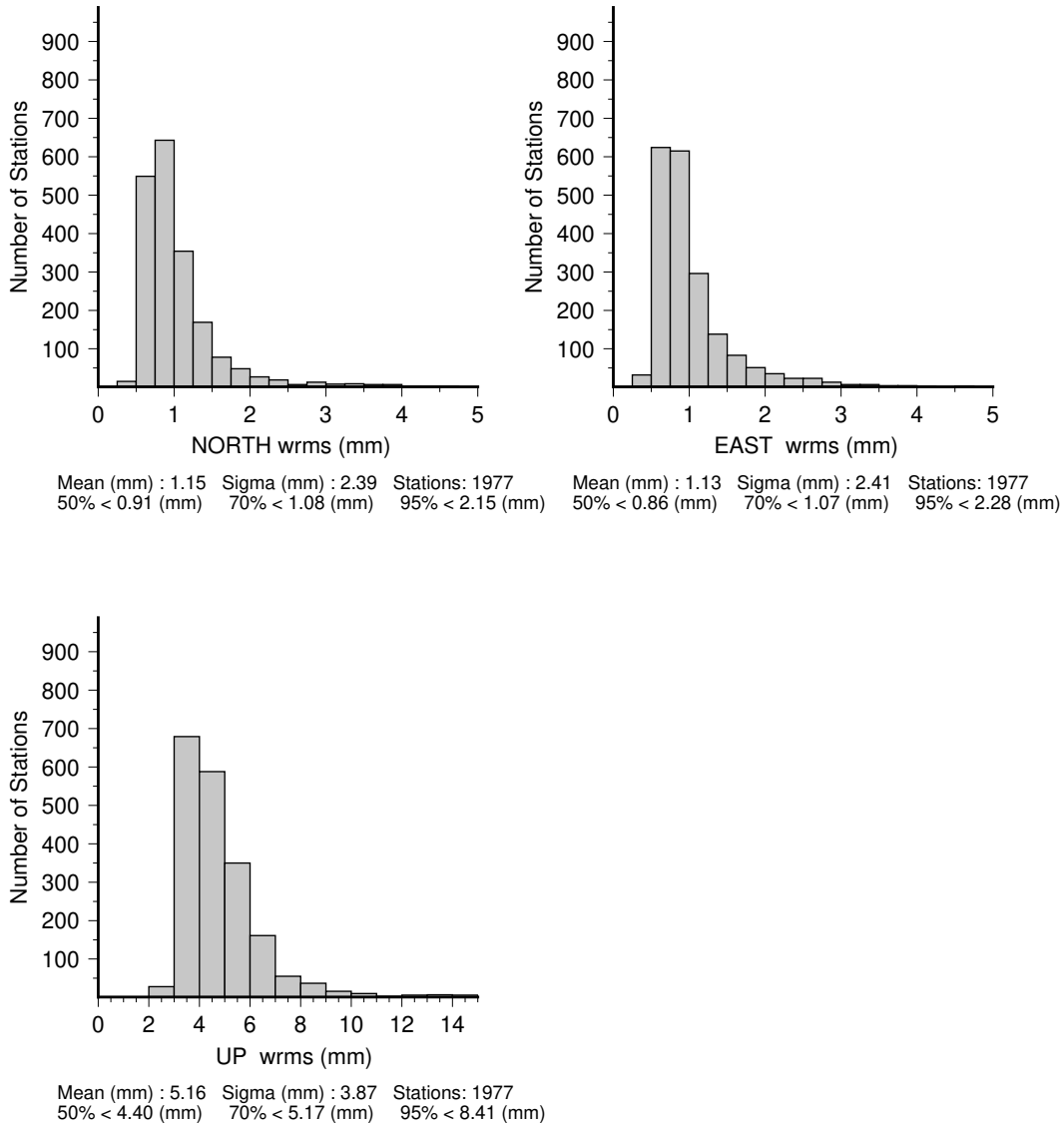
For this report, we generated the statistics using the ~3 months of CWU results between March 15, 2024, and June 22, 2024. These results are summarized in Table 1 and Figure 1.

For the three months of the final position time series generated, we fit linear trends and annual signals and compute the RMS scatters of the position residuals in north, east, and up for each station in the analysis. Table 1 shows the median (50%), 70%, and 95% limits for the RMS scatters CWU. The detailed histograms of the RMS scatters are shown in Figure 1 CWU.

Table 1: Statistics of the fits of 1977 stations for CWU analyzed in the finals analysis between March 15, 2024, and June 22, 2024.

Figure 1 shows histograms of the RMS scatters.

Center	North (mm)	East (mm)	Up (mm)
Median (50%)			
CWU	0.91	0.86	4.40
70%			
CWU	1.08	1.07	5.17
95%			
CWU	2.15	2.28	8.41



Scatter-Wrms Histogram : FILE: CWU_FIN_Y6Q4.sum

Figure 1: CWU solution histograms of the North, East, and Up RMS scatters of the position residuals for 1977 stations analyzed between March 15, 2024 and June 22, 2024. Linear trends and annual signals were estimated from the time series.

For the CWU analysis, we also evaluate the RMS scatters of the position estimates by network type. The figures below are based on our monthly submissions, but here, we use nominally three months of data to evaluate the RMS scatters. In Table 2, we give the median, 70, and 95 percentile limits on the RMS scatters. The geographical distributions of the RMS scatters by network type are shown in Figures 2-7. The values plotted are given in

[CWU_FIN_Y6Q3.tab](#). There are 1974 stations in the file for sites with at least two measurements during the month.

Table 2: Head and tail of WRMS scatter summary file CWU_FIN_Y6Q3.tab. Tabular Position RMS scatters created from CWU_FIN_Y6Q3.sum
ChiN/E/U are square root of chisquared degree of freedom of the fits. Values of ChiN/E/U near unity indicate that the estimated error bars are consistent the scatter of the position estimates

.Site	#	N (mm)	ChiN	E (mm)	ChiE	U (mm)	ChiU	Years
1LSU	100	1.3	0.73	1.6	0.76	8.3	0.90	21.17
1NSU	100	1.0	0.58	1.1	0.64	6.4	0.86	20.42
1ULM	100	1.1	0.64	1.1	0.65	5.9	0.80	21.02
70DM	58	0.9	0.50	0.7	0.45	3.9	0.49	23.17
...								
ZDV1	100	0.9	0.46	1.0	0.65	5.3	0.71	21.05
ZKC1	100	0.9	0.50	0.9	0.58	5.6	0.73	21.05
ZLA1	100	1.2	0.67	0.9	0.61	4.5	0.59	21.05
ZLC1	100	0.7	0.38	0.8	0.50	4.2	0.56	21.28
ZME1	100	1.0	0.59	0.9	0.56	6.4	0.86	21.28
ZMP1	100	0.8	0.40	0.8	0.48	4.8	0.64	21.52
ZNY1	100	0.8	0.43	0.8	0.51	5.3	0.71	21.44
ZOA1	98	0.8	0.43	0.5	0.37	3.4	0.45	21.97
ZSE1	100	1.1	0.50	0.7	0.44	4.5	0.61	21.44
ZTL4	100	1.0	0.58	1.0	0.63	8.2	1.10	21.63

Table 2: RMS scatter of the position residuals for the CWU solution between March 15, 2024, and June 22, 2024, divided by network type. The division of networks is based on the JAVA script unavcoMetdata.jar with network codes PBO, Nucleus, Mid- SCIGN_USGS, America GAMA, COCONet and Expanded PBO

Network	North (mm)	East (mm)	Up (mm)	#Sites
Median (50%)				
PBO	0.80	0.79	4.02	799
NUCLEUS	0.76	0.71	3.84	188
GAMA	0.97	0.94	5.49	14
COCONet	1.47	1.57	6.64	72
USGS_SCIGN	0.82	0.77	3.92	117
Expanded	1.00	0.94	5.01	787
70%				
PBO	0.97	0.95	4.53	
NUCLEUS	0.89	0.83	4.25	
GAMA	0.98	0.99	5.60	

COCONet	1.67	1.87	7.29
USGS_SCIGN	1.05	0.92	4.41
Expanded	1.16	1.16	5.65
95%			
PBO	1.95	2.06	7.08
NUCLEUS	1.29	1.30	5.48
GAMA	1.11	1.12	6.32
COCONet	3.90	5.94	17.84
USGS_SCIGN	1.78	1.85	7.48

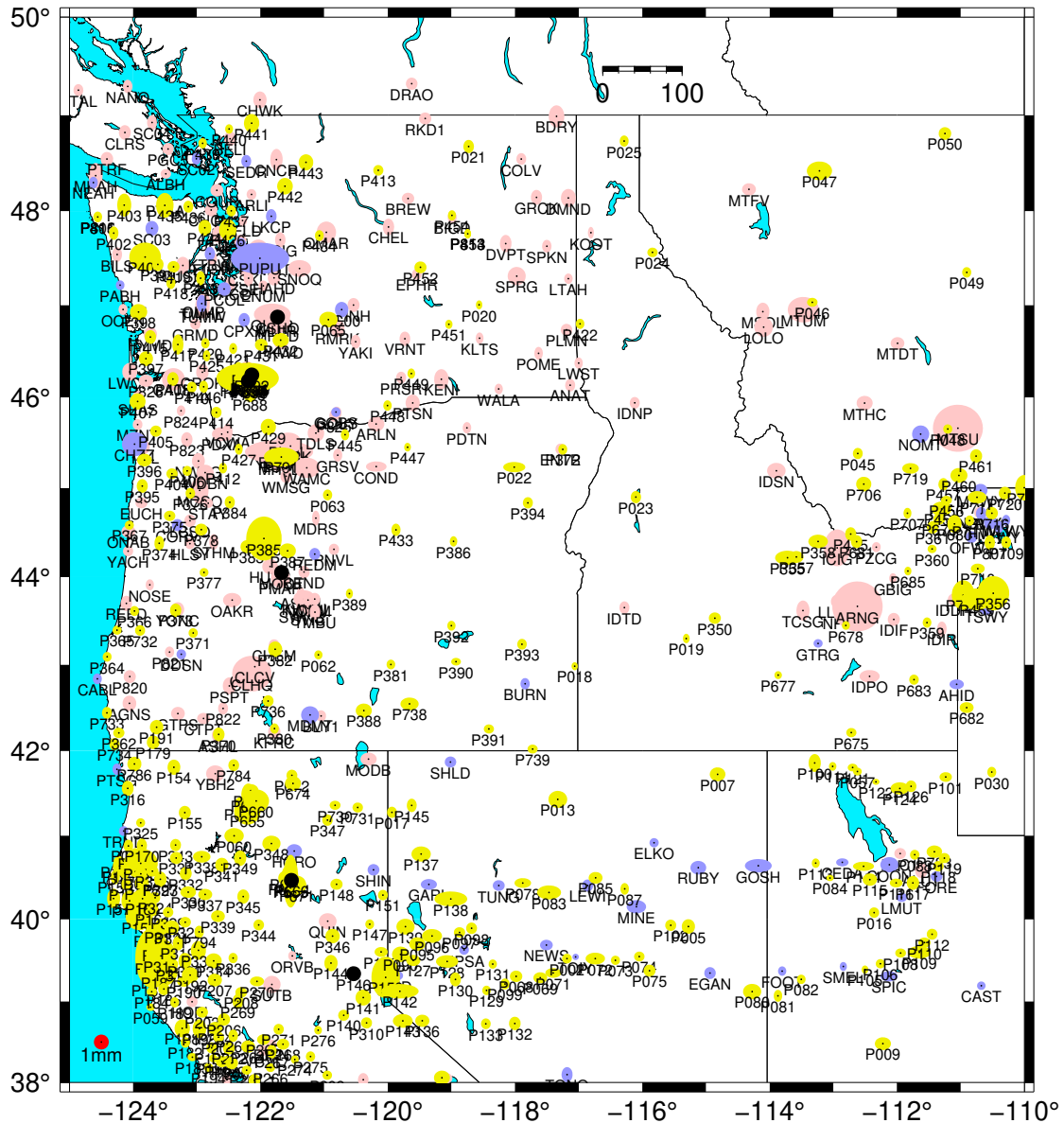


Figure 2: Distribution of the RMS scatters of horizontal position estimates from the CWU analysis for the Northern Western United States. The color of the ellipses that give the north and east RMS scatters denotes the network given by the legend in the figure. The small red circle shows the size of 1 mm scatters. Sites shown with black circles have combined RMS scatters in north and east greater than 5 mm or are sites that have no data during this 3-month interval.

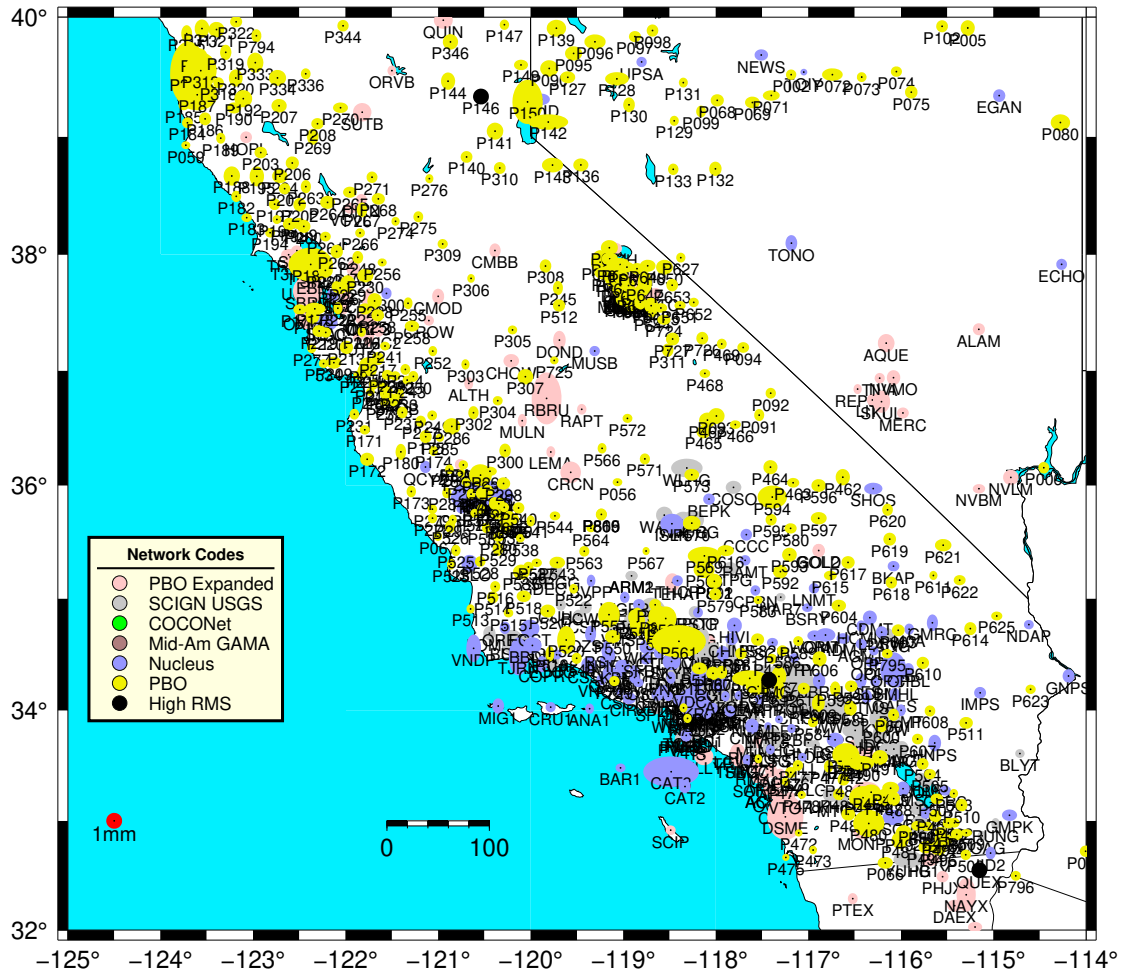


Figure 3: Same as Figure 4 except for the Southern Western United States. Black circles show large RMS scatter sites.

Snapshot velocity field analysis from the reprocessed PBO analysis.

For this quarterly report, we generate velocity estimates for the reprocessed results and the current GAGE analyses that are in the NAM14 reference frame using the CWU analysis. There are 2722 stations in the CWU solution. The statistics of the fits to results are shown in Table 3. Because these are cumulative statistics, they are little changed from last quarter. In this analysis, offsets are estimated for antenna changes and earthquakes. Annual signals are estimated, and for some earthquakes, logarithmic post-seismic signals are also estimated. The full tables of RMS fit, along with the duration of the data used, are given in [cwu_nam14_240622.tab](#). The velocity estimates are shown by region and network type in Figures 8-14. The color scheme used is the same as Figures 2-7. The snapshot velocity field file for CWU is [cwu_nam14_240622.snpvel](#).

Table 3: Statistics of the fits of 2722 stations analyzed CWU in the reprocessed analysis for data collected between Jan 1, 1996 and June 22, 2024.

Center	North (mm)	East (mm)	Up (mm)
Median (50%)			
CWU	1.41	1.38	6.26
70%			
CWU	1.79	1.75	7.15
95%			
CWU	4.21	3.72	11.71

In Figures 8-14, different tolerances are used for maximum standard deviation in each figure so that regions with small velocity vectors can be displayed at large scales without the plots being dominated by large error bar points. The standard deviations of the velocity estimated are computed using the GLOBK First-order-Gauss-Markov Extrapolation (FOGMEX) model that aims to account for temporal correlations in the time series residuals. This algorithm is also called the “Realistic Sigma” model.

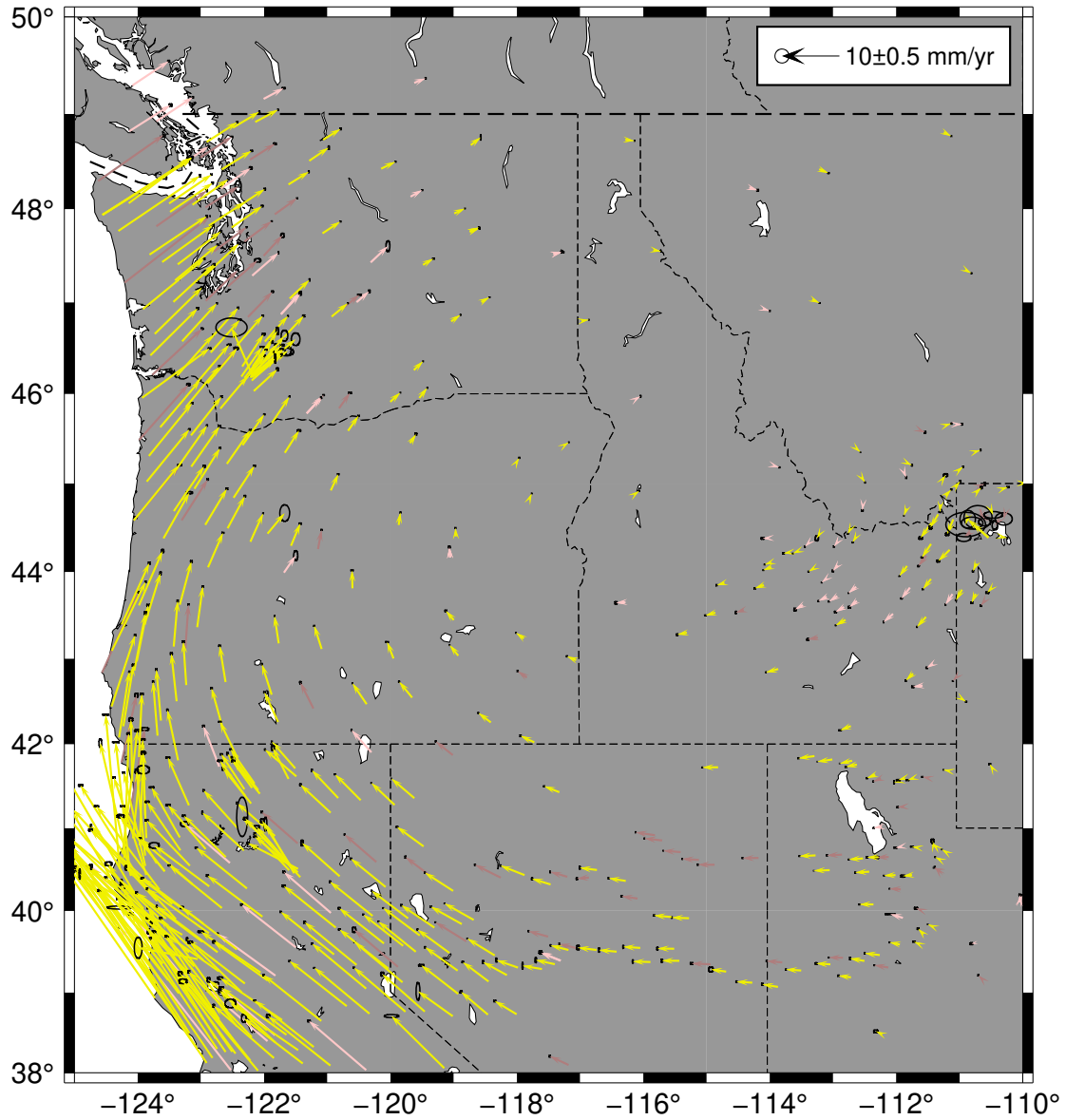


Figure 8: Velocity field estimates for the Pacific northwest from the CWU solution generated using time series analysis and the FOGMEX error model. 95% confidence interval error ellipses are shown. The color scheme of the vectors matches the network type legend in Figure 4. Only velocities with horizontal standard deviations less than 2 mm/yr are shown (this value is reduced from previous reports due to the improved velocity sigmas).

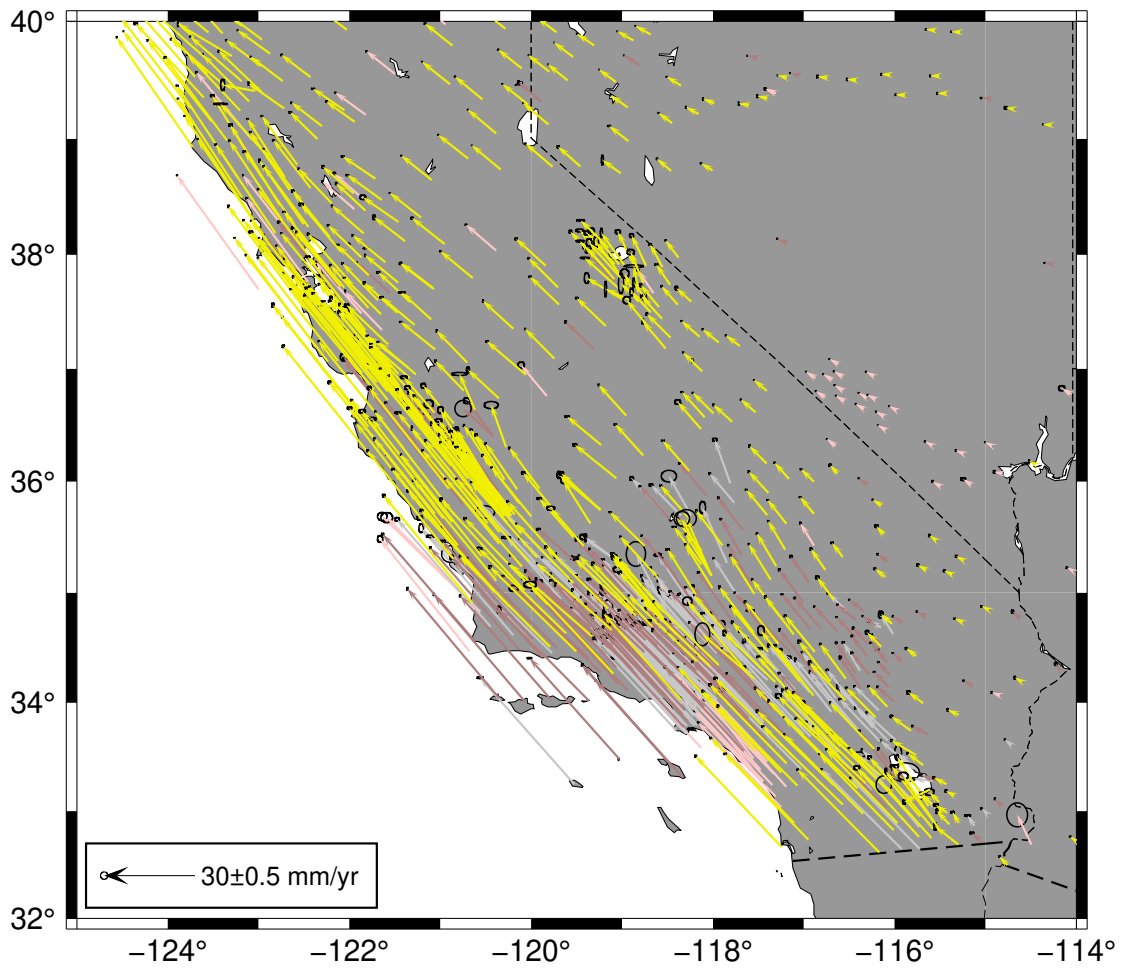


Figure 9: Same as Figure 8 except for South Western United States. Only velocities with horizontal standard deviations less than 2 mm/yr are shown.

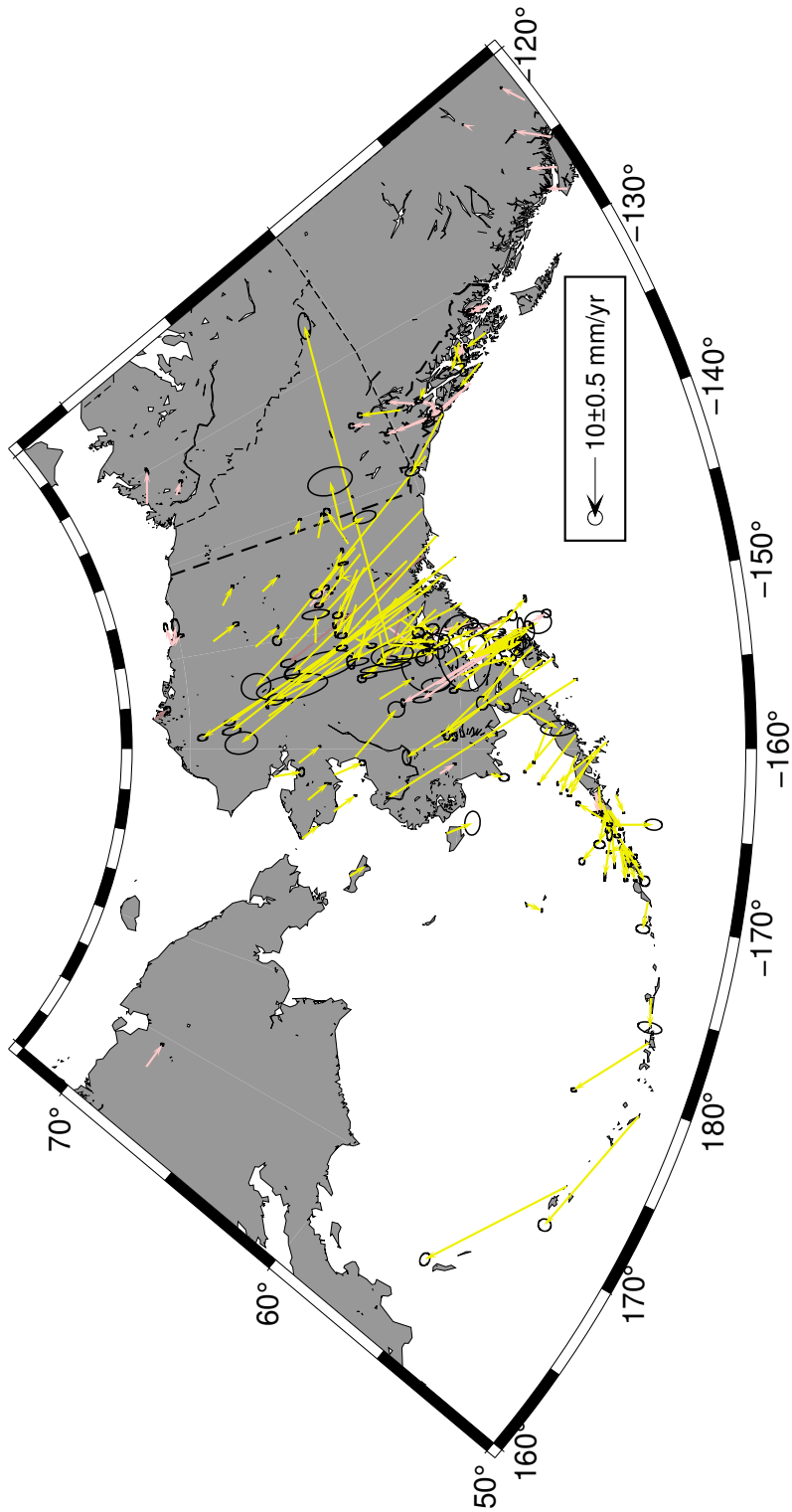


Figure 10: Same as Figure 8 except for Alaska. Only velocities with horizontal standard deviations less than 5 mm/yr are shown

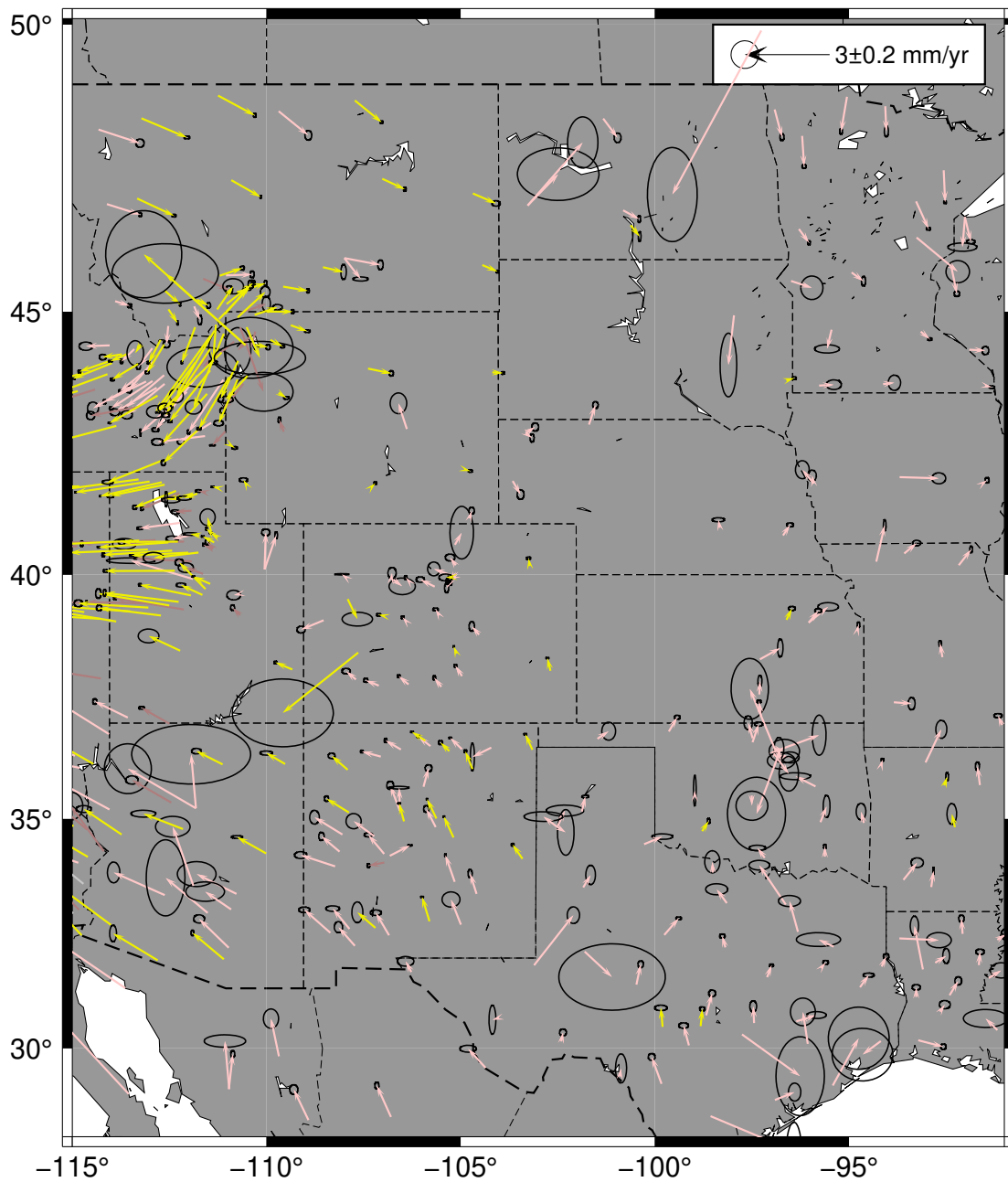


Figure 11: Same as Figure 8 except for Central United States. Only velocities with horizontal standard deviations less than 1 mm/yr are shown.

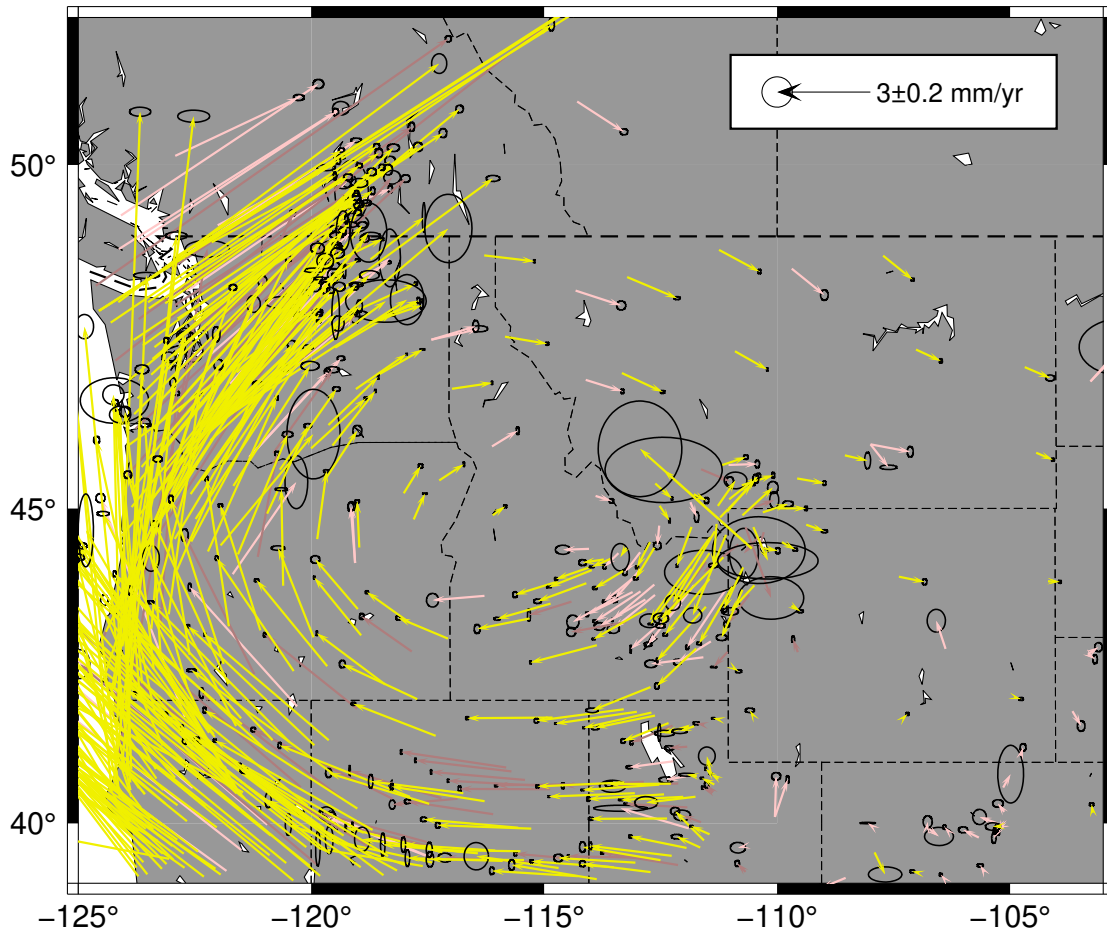


Figure 12: Same as Figure 8 except for Western Central United States. Only velocities with horizontal standard deviations less than 1 mm/yr are shown. Anomalous vectors at longitude 125° are in the Yellowstone National Park and most likely are showing volcanic processes.

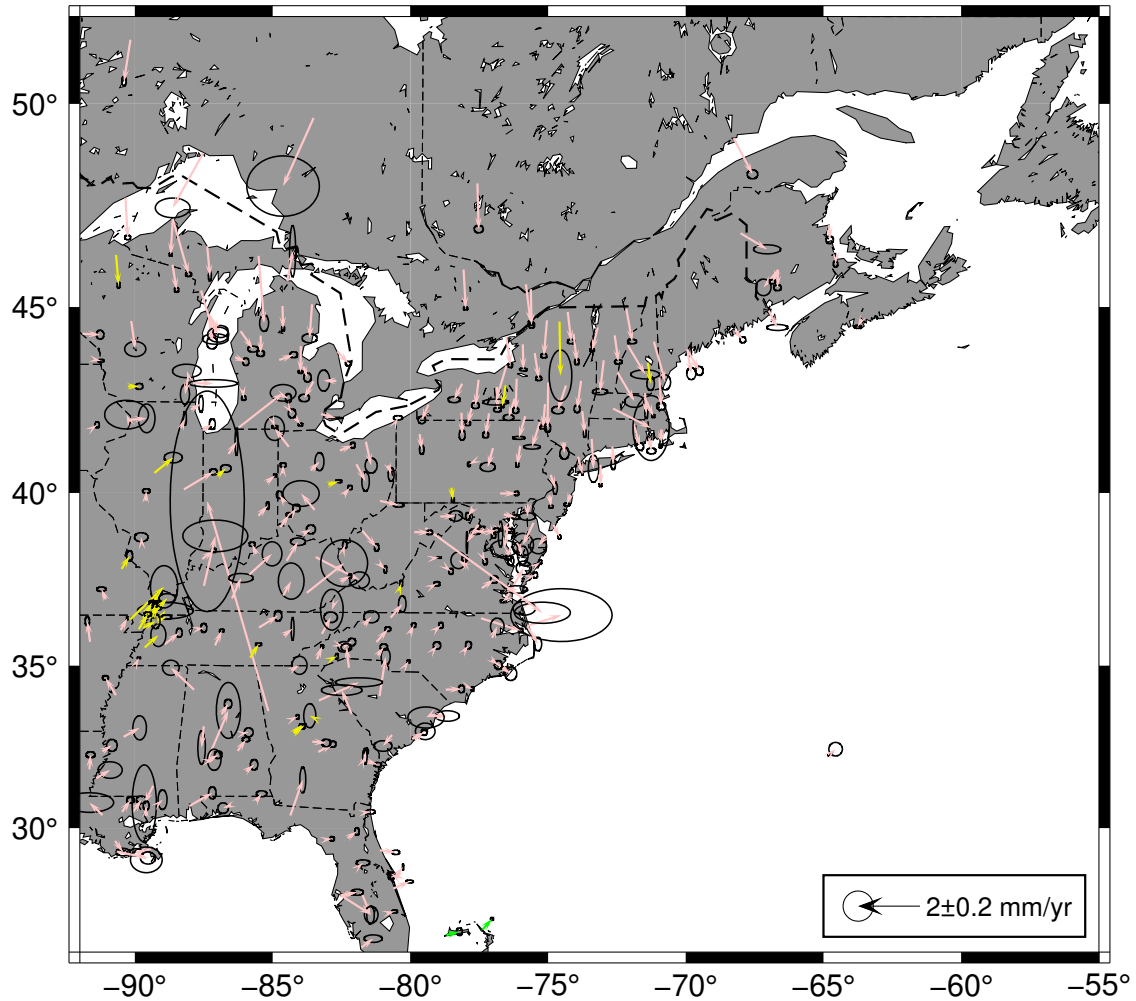


Figure 13: Same as Figure 8 except for the Eastern United States. Only velocities with horizontal standard deviations less than 2 mm/yr are shown. The systematic velocity of sites in the Northeast and central US show deviations for current GIA models in the horizontal velocities.

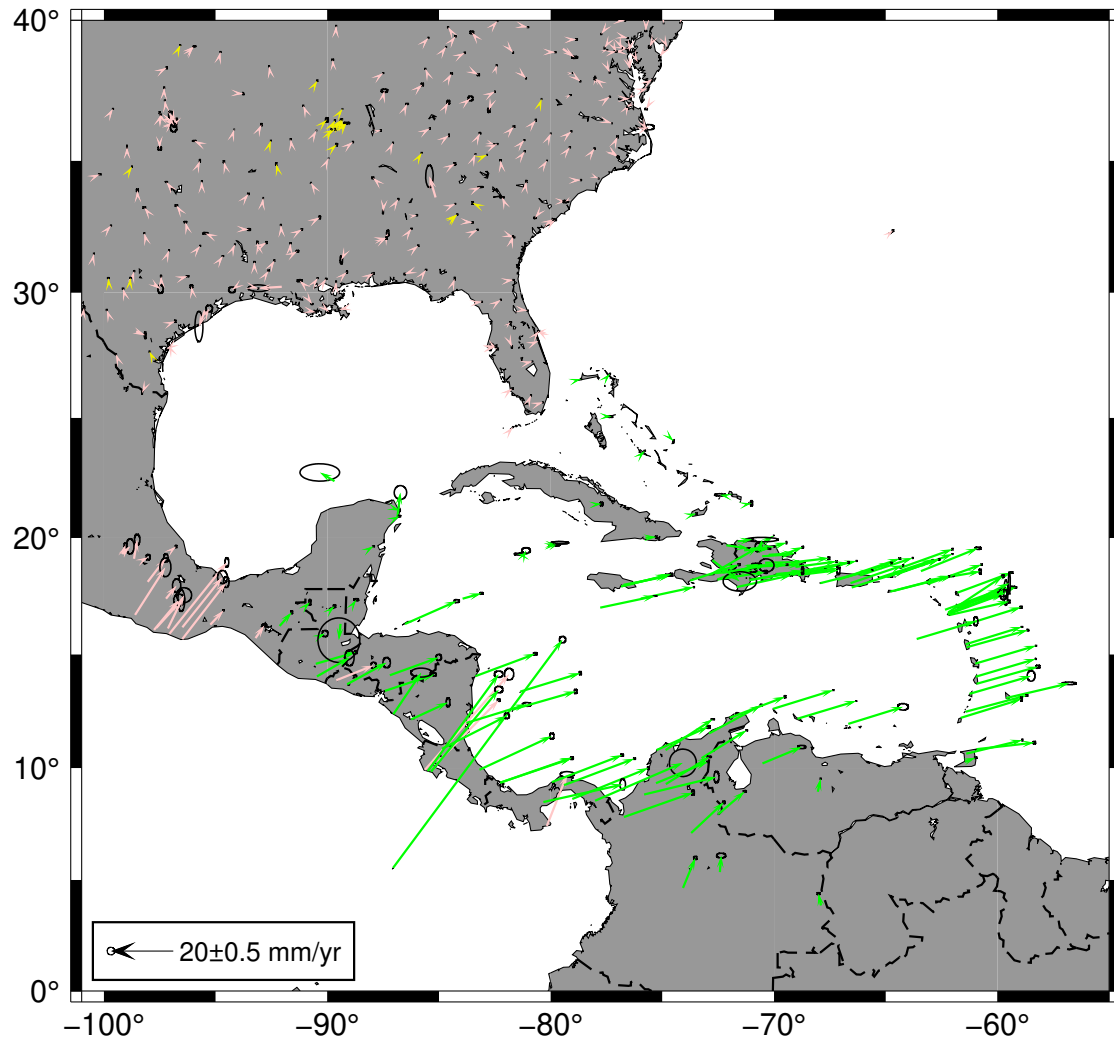


Figure 14: Same as Figure 8 except for the Caribbean region. Only velocities with horizontal standard deviations less than 5 mm/yr are shown.

Earthquake Analyses: 2023/12/15-2024/06/15

We use the NEIC catalog to search for earthquakes that could cause coseismic offsets at the sites analyzed by the GAGE analysis centers. Of the 33 earthquakes examined during this quarter, none generated co-seismic offsets greater than 1 mm.

Antenna and other discontinuity events.

Antenna swaps at 30 sites have been added to the list of offsets that are estimated when fitting velocities and other parameters to the CWU time series. These offsets were spread throughout the quarter.

Anomalous sites

The following sites have been noted as having anomalous motions during this quarter. We updated the ACC_GAGE website to show times of earthquakes, antenna changes, and offsets for unknown reasons. Plots for CWU are now generated with and without offsets (computed from the Kalman filter time series analysis) removed. The landing page for http://geoweb.mit.edu/~tah/ACC_GAGE/ now has the following explanation.

NOTA RAPID Solution Outlier sites for PROD ID 20230120183013

Analyses from Central Washington University (CWU). Series are:

- NMT -- Old plots from New Mexico Tech Analyses (Ends 9/15/2018).
- PBO -- Old plots from Combined NMT+CWU analyses (Ends 9/15/2108).
- CWURAW -- Raw time series with linear trend removed
- CWUOFF -- Time series with linear trend and offsets from http://geoweb.mit.edu/~tah/ACC_GAGE/ removed

Vertical lines denote times of offsets in time series:

- Purple, solid: Earthquakes (OffEq ! EQ)
- Blue, dotted: Antenna changes (Break ! AN)
- Cyan, dashed: Breaks for unkown reasons (Break ! UN)

N after site name means NOTA operated site, U means UNAVCO/Earthscope log file.

Site	N	Issues related to site
		2024-04-26
CN60	N	Jump of N 26mm, E -8mm on 2024/04/21. No change in metadata. Site on Contadora Island, Panama. Time series plots not updated on station page. http://geoweb.mit.edu/~tah/ACC_GAGE/CN60.CWUOFF.png
HAMM		CORS site in Louisiana, east jump in rapids ~20 mm. Persisted so added offset added after firmware change on day of offset. TRM Alloy http://geoweb.mit.edu/~tah/ACC_GAGE/HAMM.CWUOFF.png
		2024-05-02
BARA	U	Dominican Republic site. Offsets in North and East by ~20 mm. http://geoweb.mit.edu/~tah/ACC_GAGE/BARA.CWUOFF.png
TN35		Height jump in rapids. Tennessee CORS site. No metadata updates. See if persists. http://geoweb.mit.edu/~tah/ACC_GAGE/TN35.CWUOFF.png
		2024-05-10
MTDT		CORS site in Montana. Offsets in North and Height in rapid. See if they persist. http://geoweb.mit.edu/~tah/ACC_GAGE/MTDT.CWUOFF.png
MTLW		CORS site in Montana. Offset mostly in height of about the same magnitude as MTDT. Looks like antenna change but no metadata update. http://geoweb.mit.edu/~tah/ACC_GAGE/MTLW.CWUOFF.png
		2024-05-17 Not in monthly
DVPB	U	NE of LA. Poor offset estimates because postseismic from 2019/07/06

		(Ridgecrest EQ) poorly separated from antenna change after large gap. http://geoweb.mit.edu/~tah/ACC_GAGE/DVPB.CWUOFF.png
PHJX	U	Just south of Mexican border. Post-seismic curvature for El Major Cucapah from but large gap and an a 2012 aftershock make estimation difficult. http://geoweb.mit.edu/~tah/ACC_GAGE/PHJX.CWUOFF.png
		2024-05-23
BON2	U	Site in Costa Rica. Went bad in 2022 when NetR9 changed (2022 80, new serial number). Rapid solutions show 8 mm NE, 33 mm U RMS. (Data edited from plots). http://geoweb.mit.edu/~tah/ACC_GAGE/BON2.CWUOFF.png
		2024-05-31
TN16		CORS site, Antenna change. Meta data needs to be updated. http://geoweb.mit.edu/~tah/ACC_GAGE/TN16.CWUOFF.png
		2024-06-07
WVBU		CORS site in Virginia. Strong annual in East 2019-2023. Recent small drift in North. (WVMF 45 km away shows strong growth in North annual). May be wrong year in log file for (first) antenna change. http://geoweb.mit.edu/~tah/ACC_GAGE/WVBU.CWUOFF.png
		2024-06-21 Not in Monthly
P794	N	Site in Covelo CA (2088 meters high). Looks like snow event may have bent monument. Tall pole with bracing. http://geoweb.mit.edu/~tah/ACC_GAGE/P794.CWUOFF.png
TN13		Antenna change from TPSG3_A1 to LEIAR10 looks like 50 mm height change. (sh_plot_update to check later (-50 mm dU change seen at TN16 for same swap 20 days earlier). http://geoweb.mit.edu/~tah/ACC_GAGE/TN13.CWUOFF.png
		2024-06-27
KYMH		Previously reported failed antenna, CORS site in Kentucky. Break in data but no new meta data. http://geoweb.mit.edu/~tah/ACC_GAGE/KYMH.CWUOFF.png
P265	N	New antenna. Check when metadata updated. http://geoweb.mit.edu/~tah/ACC_GAGE/P265.CWUOFF.png
RBRU		Site near Fresno, CA. Looks like tree growth. http://geoweb.mit.edu/~tah/ACC_GAGE/RBRU.CWUOFF.png
UPTC		CORS site in Pennsylvania, Had a span of low accuracy data (2014-2021), improved but then went offline. Back online with new receiver but data quality is low (same antenna). RFI at site? New data edited from plots. http://geoweb.mit.edu/~tah/ACC_GAGE/UPTC.CWUOFF.png
WAMC		PANGA sites, Look like new antenna but no meta data update yet. http://geoweb.mit.edu/~tah/ACC_GAGE/WAMC.CWUOFF.png
		2024-07-08
YBH2		CORS site run by BSL in Yreka Blue Horn Mine, Northern California. Looks like antenna change but no new logfile. http://geoweb.mit.edu/~tah/ACC_GAGE/YBH2.CWUOFF.png

P170	N	Northern California, 100 mm East jump in rapids. Check later to see if it persists. http://geoweb.mit.edu/~tah/ACC_GAGE/P170.CWUOFF.png
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GNSS Rapid processing

Since 2021/10/20, CWU has generated a combined GPS and Galileo rapid solution because JPL has made available orbit and clock files from a global GPS and Galileo solution. These solutions are experimental, and for a number of sites, there are systematic mean differences in position between the GPS-only and the combined solutions. For this reason, these combined solutions are not distributed through the EarthScope GAGE products portal. Initially, there were inconsistencies in the GPS-only and combined analyses (e.g., elevation angle cutoff) that affected the comparison of the results, specifically when comparing mean positions and WRMS scatters of the fits to linear trends. Starting on 2024/03/26, these inconsistencies were resolved and since that time, a direct comparison of the GPS-only and combined GPS and Galileo solutions is possible. Results of the comparisons are reported daily to the GAGE_ACS email list. With over three months of consistently processed results now available, we present a comparison of the results below. The current analysis used 471 stations with up to 106 days of comparison. The median NEU scatters for the GPS+GAL solutions are 0.76, 0.79, and 3.75 mm. The corresponding values from the common GPS-only solutions are 0.86, 0.83, and 3.97 mm, which are slightly larger than the values from the GPS+GAL solution.

Table 4: Mean differences between GPS-only and GPS+Galileo rapid solutions. Differences are taken as GPS+GAL minus GPS-only position estimates. The largest 10 positive and negative differences in Up, North, and East are shown. The sig column is the standard deviation of the mean (assuming white noise statistics), wrms is the weighted root-mean-square scatter about the mean, and nrms is the normalized root mean square ($\sqrt{\chi^2/f}$).

Site	#	MeanDiff (mm)	sig (mm)	wrms (mm)	nrms	Receiver	Antenna	Radome
FLIN	U 106	-14.28	0.20	2.04	0.23	SEPT POLARX5	NOV750.R4	NOVS
SASK	U 106	-12.66	0.18	1.84	0.21	JAVAD TRE_G3TH DELTA	NOV750.R4	NOVS
ARBT	U 106	-11.05	0.53	5.47	0.58	TRIMBLE NETR9	TRM115000.00	NONE
PTRF	U 106	-8.21	0.34	3.46	0.36	SEPT POLARX5S	SEPCHOKE_B3E6	SPKE
MHMS	U 106	-7.12	0.37	3.78	0.38	SEPT POLARX5	TWIVC6150	SCIT
P195	U 106	-6.36	0.68	6.97	0.57	SEPT POLARX5	TRM59800.99	SCIT
1LSU	U 54	-6.24	1.01	7.43	0.65	TRIMBLE ALLOY	TRM115000.00	NONE
PKRD	U 106	-6.20	0.79	8.13	0.68	SEPT POLARX5	TRM59800.99	SCIT
VDCY	U 106	-6.16	0.47	4.84	0.44	SEPT POLARX5	TRM59800.99	SCIT
P312	U 106	-6.08	2.42	24.89	0.81	TRIMBLE NETR9	TRM59800.80	SCIT
....								
P505	U 99	5.84	1.22	12.11	1.27	TRIMBLE NETR9	TRM59800.80	SCIT
ARML	U 93	6.60	0.44	4.23	0.46	SEPT POLARX5	SEPPOLANT_X_MF	NONE
CJTR	U 92	6.75	0.51	4.92	0.52	SEPT POLARX5	SEPPOLANT_X_MF	NONE
CHZZ	U 106	7.01	0.73	7.52	0.55	TRIMBLE NETR9	TRM59800.80	SCIT

P385	U	106	7.74	0.70	7.19	0.74	SEPT POLARX5	TRM59800.80	SCIT
HCES	U	17	7.81	1.10	4.54	0.50	SEPT POLARX5	SEPPOLANT_X_MF	NONE
LCHS	U	78	7.90	0.56	4.92	0.53	SEPT POLARX5	SEPPOLANT_X_MF	NONE
P156	U	64	7.92	2.02	16.13	1.00	SEPT POLARX5	TRM59800.80	SCIT
MCTY	U	78	8.68	0.60	5.28	0.55	SEPT POLARX5	SEPPOLANT_X_MF	NONE
COLA	U	106	16.74	1.16	11.98	1.26	TRIMBLE ALLOY	TRM55971.00	NONE
Station	#	MeanDiff	sig	wrms	nrms	Receiver	Antenna	Radome	
		(mm)	(mm)	(mm)					
LONG	N	106	-4.40	0.29	2.97	0.98	SEPT POLARX5	TWIVC6150	SCPL
COLA	N	106	-2.40	0.13	1.35	0.62	TRIMBLE ALLOY	TRM55971.00	NONE
MHMS	N	106	-1.72	0.08	0.83	0.34	SEPT POLARX5	TWIVC6150	SCIT
AB11	N	72	-1.58	0.12	0.98	0.36	SEPT POLARX5	TRM59800.99	SCIT
AB18	N	105	-1.57	0.09	0.89	0.31	SEPT POLARX5	TRM59800.99	SCIT
P669	N	106	-1.55	0.08	0.79	0.30	SEPT POLARX5	TWIVC6050	SCIS
P224	N	106	-1.48	0.08	0.87	0.34	TRIMBLE NETR9	TRM59800.00	SCIT
KBRC	N	106	-1.46	0.17	1.73	0.78	TRIMBLE NETR9	TRM59800.00	SCIT
AC12	N	105	-1.37	0.08	0.79	0.30	SEPT POLARX5	TRM59800.80	SCIT
SLAC	N	106	-1.36	0.07	0.75	0.31	TRIMBLE NETR9	TRM59800.80	NONE
....									
MARG	N	106	1.33	0.05	0.49	0.17	ALERTGEO RESOLUTE	LEIAR20	LEIM
DKSG	N	106	1.36	0.06	0.61	0.21	ALERTGEO RESOLUTE	LEIAR20	LEIM
P312	N	106	1.37	0.43	4.48	0.80	TRIMBLE NETR9	TRM59800.80	SCIT
RG08	N	106	1.54	0.16	1.62	0.74	SEPT POLARX5	TRM59800.99	SCIT
P794	N	22	1.61	0.09	0.41	0.17	SEPT POLARX5	TRM59800.00	SCIT
KYMH	N	83	1.77	0.11	0.97	0.43	TRIMBLE NETR3	TRM57971.00	NONE
P252	N	53	2.28	0.20	1.49	0.65	TRIMBLE NETR9	TRM29659.00	SCIT
OSPA	N	106	2.74	0.06	0.62	0.25	SEPT POLARX5	ASH701945B_M	SNOW
P156	N	64	3.01	0.24	1.90	0.51	SEPT POLARX5	TRM59800.80	SCIT
P385	N	106	4.50	0.20	2.02	0.76	SEPT POLARX5	TRM59800.80	SCIT
Station	#	MeanDiff	sig	wrms	nrms	Receiver	Antenna	Radome	
		(mm)	(mm)	(mm)					
CAT3	E	106	-4.98	0.33	3.41	0.44	TRIMBLE ALLOY	TRM59800.80	SCIT
P187	E	106	-2.06	0.26	2.66	0.88	SEPT POLARX5	TRM59800.99	SCIT
CN20	E	106	-1.93	0.28	2.90	1.18	TRIMBLE NETR9	TRM59800.00	SCIT
BOGT	E	106	-1.88	0.09	0.97	0.39	JAVAD TRE_3 DELTA	JAVRINGANT_DM	NONE
P669	E	106	-1.64	0.08	0.86	0.37	SEPT POLARX5	TWIVC6050	SCIS
P804	E	60	-1.61	1.46	11.32	1.80	TRIMBLE NETR9	TRM59800.80	SCIT
RDF2	E	74	-1.42	0.18	1.51	0.55	TRIMBLE NETR9	TRM57971.00	NONE
KVTX	E	106	-1.26	0.08	0.79	0.37	SEPT POLARX5	TRM59800.99	SCIT
AB11	E	72	-1.25	0.06	0.55	0.31	SEPT POLARX5	TRM59800.99	SCIT
GCEA	E	102	-1.23	0.11	1.10	0.50	TRIMBLE NETR5	TRM57971.00	NONE
....									
P740	E	106	1.28	0.12	1.25	0.51	SEPT POLARX5	TRM59800.99	SCIT
SPT0	E	106	1.28	0.07	0.75	0.43	SEPT POLARX5STR	TRM59800.00	OSOD
KIR0	E	105	1.38	0.07	0.76	0.42	SEPT POLARX5	JAVRINGANT_DM	OSOD
VIS0	E	105	1.41	0.07	0.76	0.43	SEPT POLARX5	AOAD/M_T	OSOD
ONSA	E	106	1.43	0.08	0.85	0.49	SEPT POLARX5STR	AOAD/M_B	OSOD
P505	E	99	1.60	0.27	2.67	1.35	TRIMBLE NETR9	TRM59800.80	SCIT
YORK	E	106	2.36	1.08	11.15	1.86	TRIMBLE ALLOY	TRM115000.10	NONE
EGAN	E	106	2.48	0.32	3.25	1.67	TRIMBLE NETR9	TRM59800.80	SCIS
NDAP	E	106	2.89	0.29	3.01	1.54	TRIMBLE NETR9	TRM59800.80	SCIT
P191	E	106	5.17	0.42	4.37	2.32	TRIMBLE NETR9	TRM59800.80	SCIT

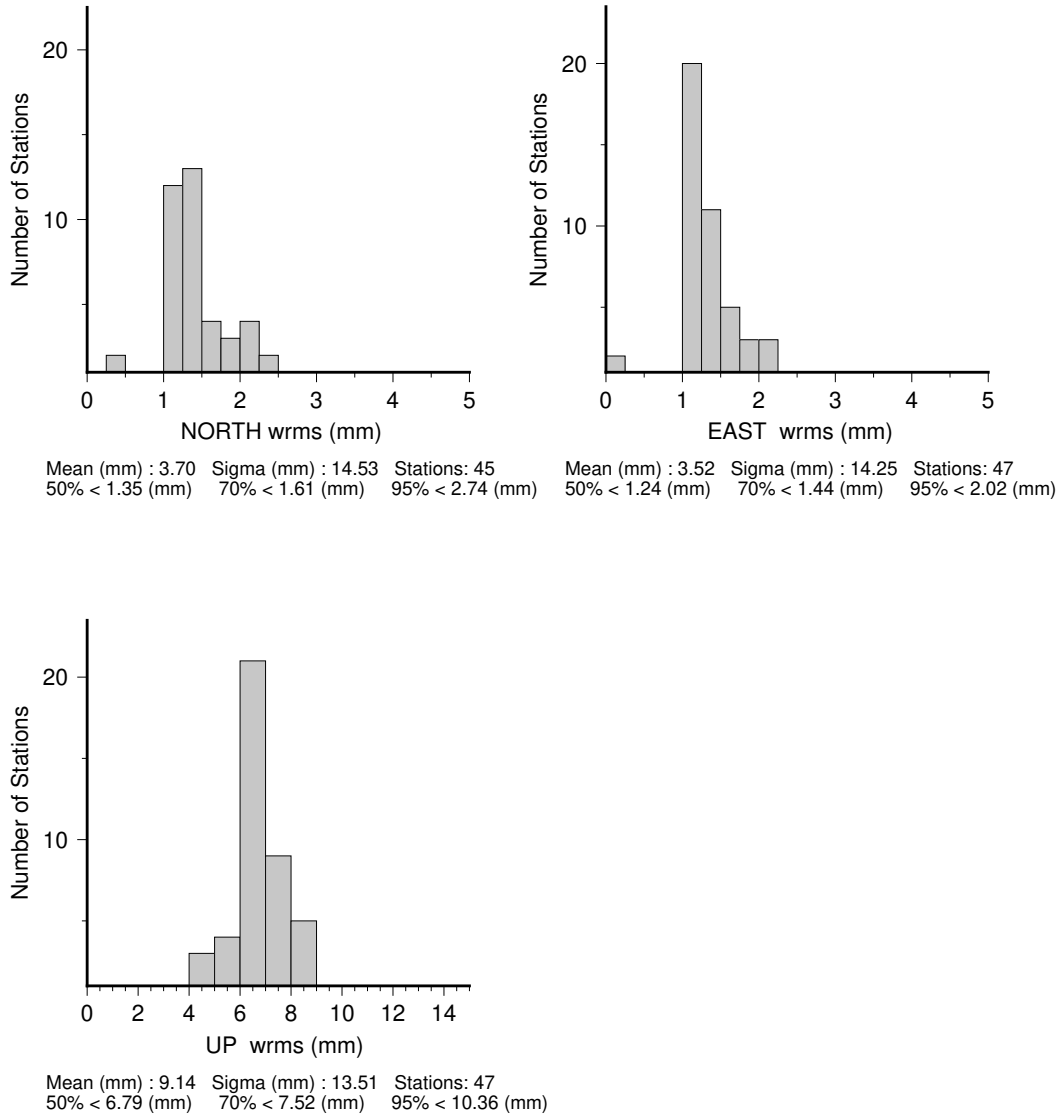
ANET Processing

The ANET additional sites are being processed as a separate network, and the frame-resolved SINEX files will be given in the Antarctica 2014 reference frame (Altamimi *et al.*, 2016, 2017). We label this frame ant14. Time series and SINEX files are generated only for final orbit solutions and are labeled as fanet (instead of final to avoid name conflicts with loose solutions). The IGS14 loose submission files are labeled with “lse14” to differentiate them for the IGS08 loose submissions which were simply label as loose. The statistics of the time series fits from the CWU solution for this quarter are given in Table 5.

Table 5: Statistics of the fits of 47 stations in the ANET region for CWU analyzed in the final orbit analysis between March 15, 2024 and June 22, 2024.

CWU	North (mm)	East (mm)	Up (mm)
Median			
ANET	1.35	1.24	6.79
70%			
ANET	1.61	1.44	7.52
95%			
ANET	2.74	2.02	10.36

The histogram to the RMS scatter of the results for this quarter are shown in Figure A.1



Scatter-Wrms Histogram : FILE: CWU_ANT_Y6Q4.sum

Figure A.1: CWU solution histograms of the North, East and Up RMS scatters of the position residuals for 50 stations in Antarctica analyzed between March 15, 2024 and June 22, 2024. Linear trends and annual signals were estimated from the time series.

References

Altamimi, Z., P. Rebischung, L. Metivier, and X. Collilieux (2016), ITRF2014: A new release of the International Terrestrial Reference Frame modeling nonlinear station motions, *J. Geophys. Res. Solid Earth*, 121, 6109-6131, doi: 10.1002/2016JB013098.

Altamimi, Z., L. Metivier, P. Rebischung, H. Rouby, X. Collilieux; ITRF2014 plate motion model, *Geophysical Journal International*, Volume 209, Issue 3, 1 June 2017, Pages 1906-1912, <https://doi.org/10.1093/gji/ggx147>