

SUPPLEMENTARY MATERIAL

PlanetScope Imagery for Slow-Moving Landslide Monitoring: Processing Strategies, Validation and Insight on Transient Processes

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S1 Effect of corrections for correlation errors

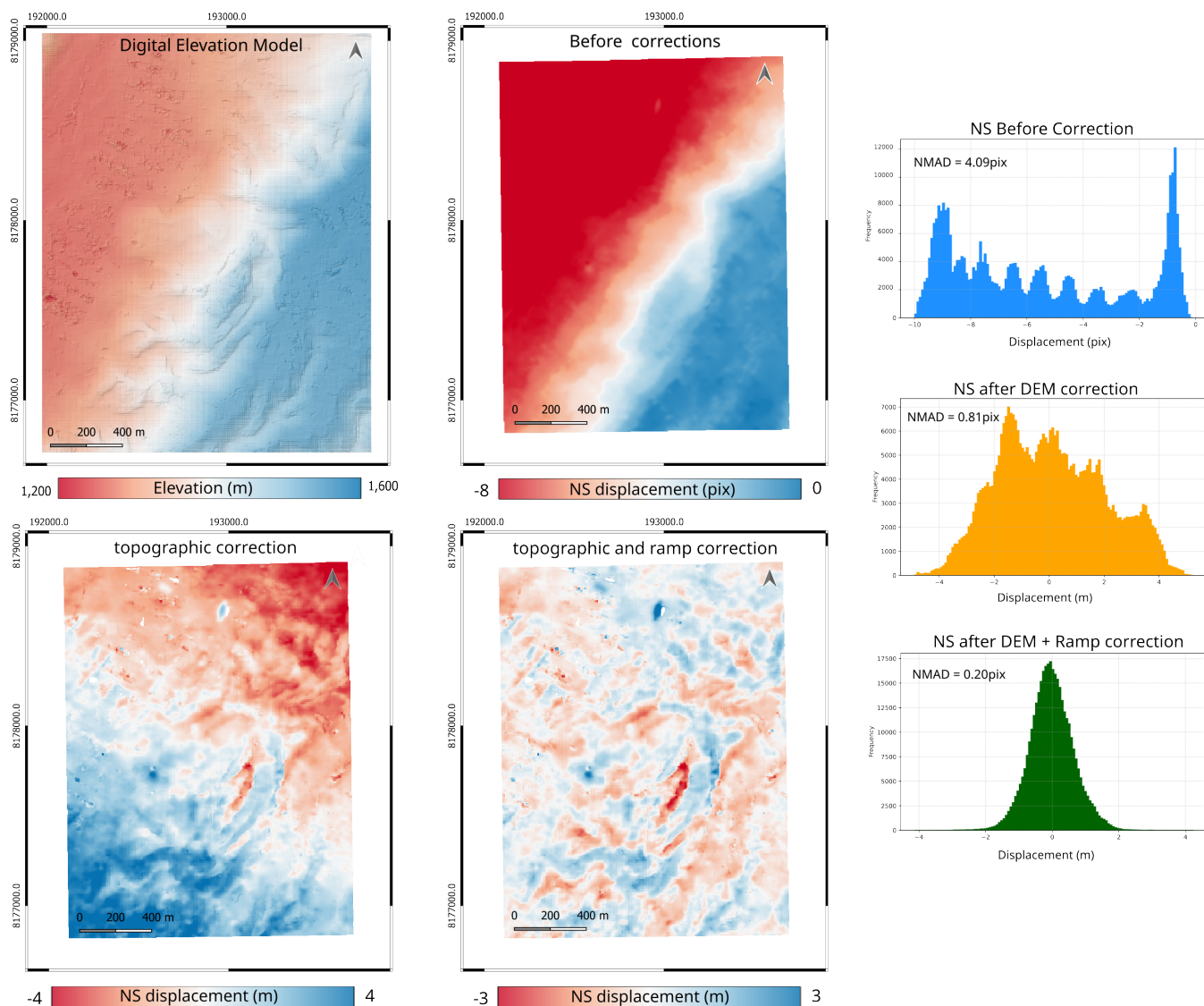


Figure S1.1. Effect of topographic and systematic error corrections on displacement in the north-south (NS) component for the Pie de la Cuesta landslide (image pair: 30/04/2019–02/05/2019). The top row shows the DEM and the initial uncorrected displacement field, where terrain-related artifacts are clearly visible. The bottom panels display the result after DEM-based correction, reducing displacement patterns aligned with topography. The final map (bottom right) includes both DEM and planar ramp corrections, revealing the cleaned signal. The three graphs on the right show the displacement field after each correction. NMAD values decrease progressively after each correction step.

S2 NMAD values for the correlated pairs of Maca and Cajabamba landslides

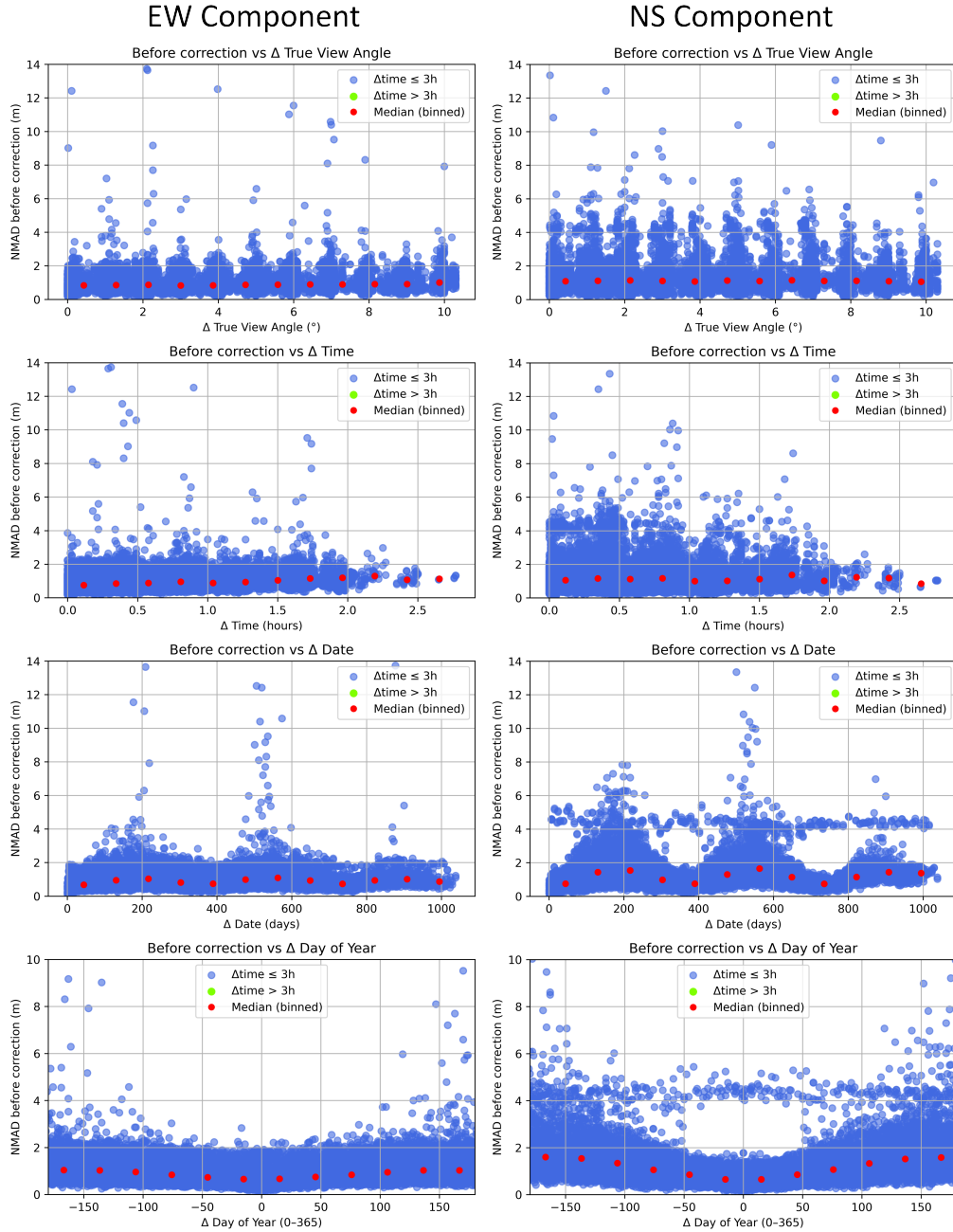


Figure S2.1. NMAD before correction vs Δ tva, Δ Hours, Δ Date, and Δ Days, between image pairs (for EW and NS components), realized for all pairs available for the Maca landslide. For Δ Days, we plotted the difference in Julian days. The pairs marked in green have a Δ Hours above three hours and show significantly high NMAD values.

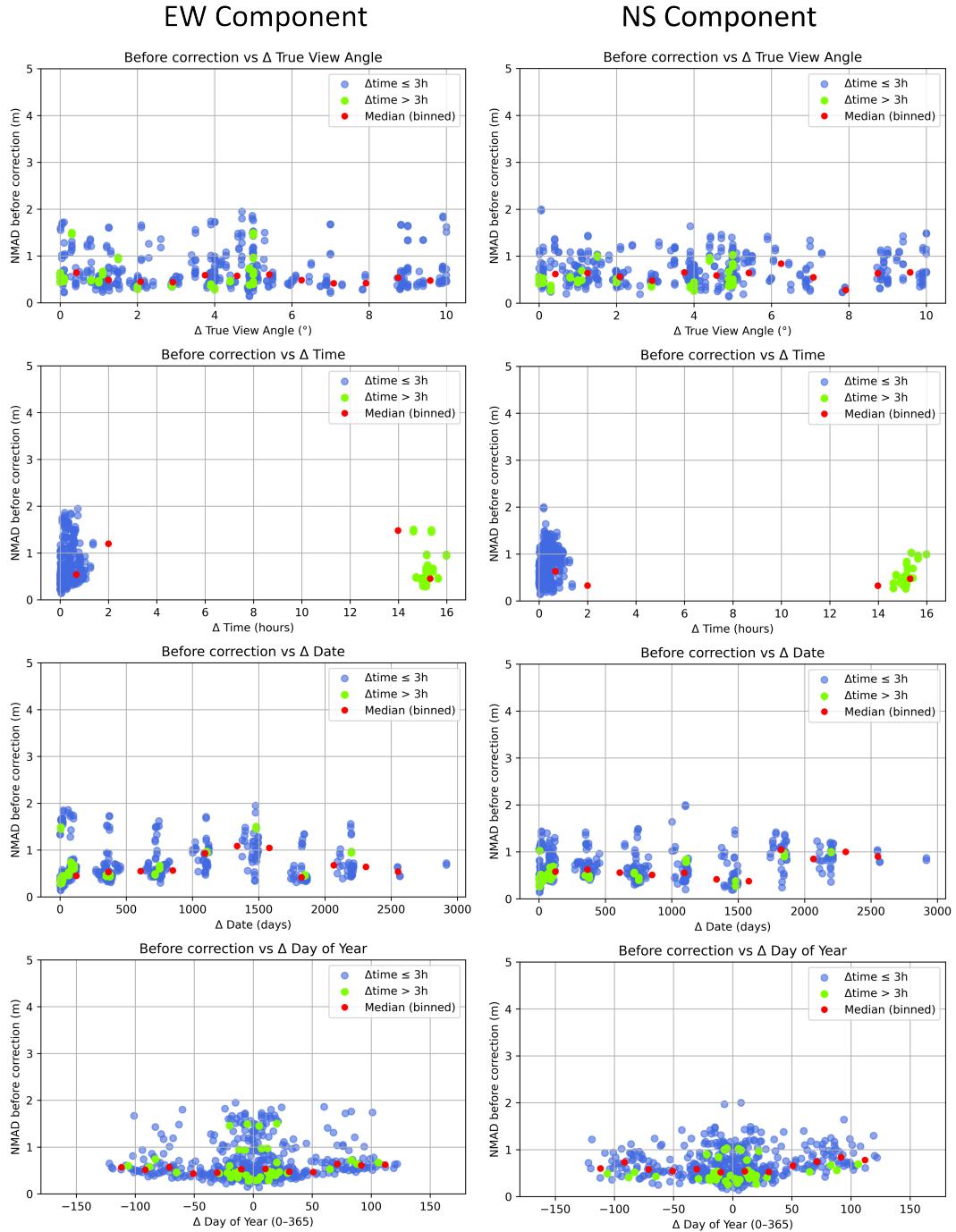


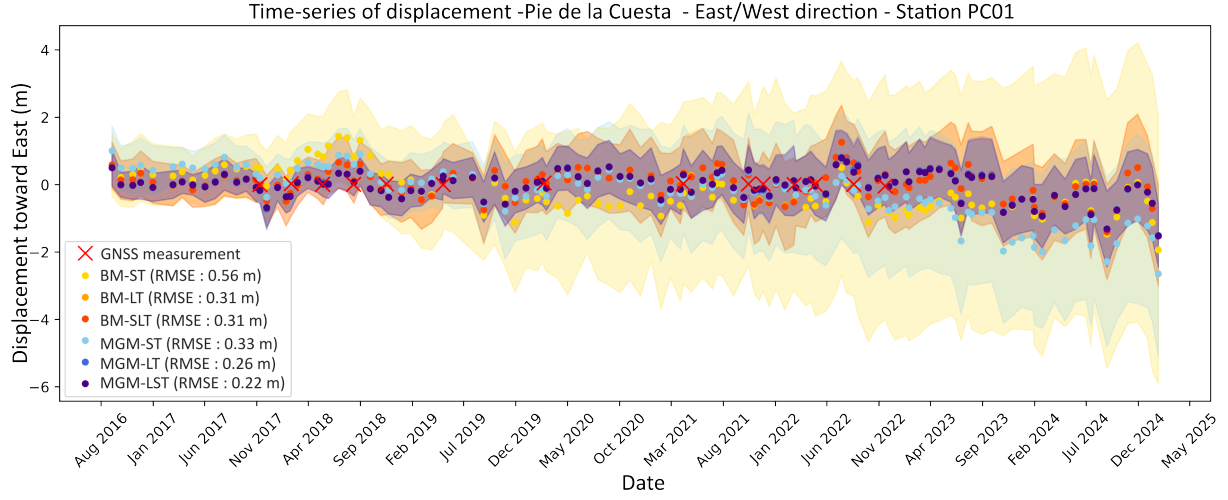
Figure S2.2. NMAD before correction vs Δ tva, Δ Hours, Δ Date, and Δ Days, between image pairs (for EW and NS components), realized for all pairs available for the Cajabamba landslide. For Δ Days, we plotted the difference in Julian days. The pairs marked in green have a Δ Hours above three hours and show significantly high NMAD values.

S3 RMSE values for Pie de la Cuesta landslide

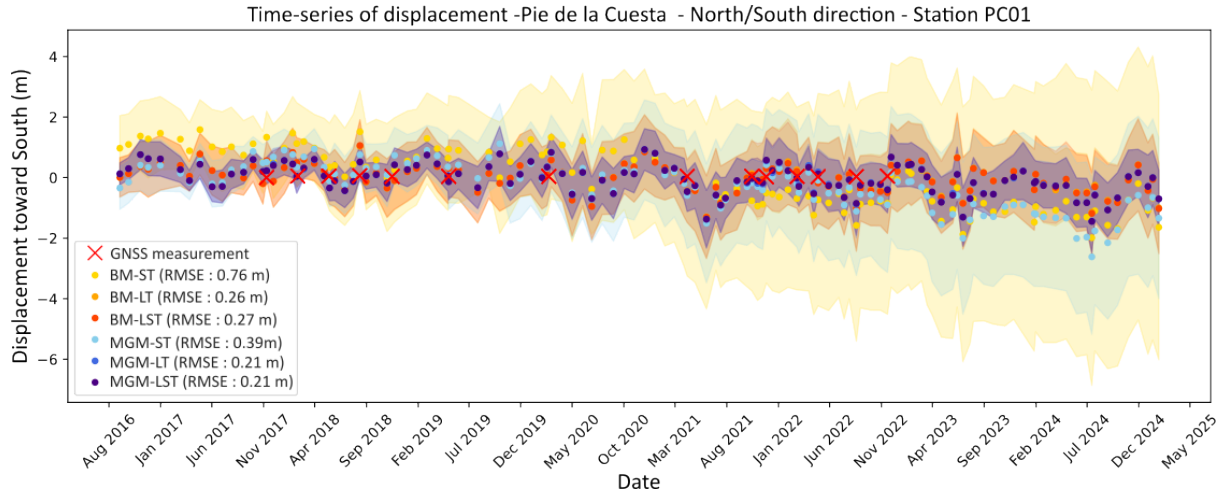
	NS component						EW Component							
pt	BM ST	BM LT	BM LST	MGM ST	MGM LT	MGM LST	BM ST	BM LT	BM LST	MGM ST	MGM LT	MGM LST	Velocity EW	Velocity NS
PC01	0.76	0.26	0.27	0.39	0.21	0.21	0.56	0.31	0.31	0.33	0.24	0.22	-0.01	-0.01
PC05	1.01	0.49	0.48	0.59	0.35	0.36	0.31	0.35	0.35	0.89	0.36	0.36	-0.08	-0.01
PC06	3.55	3.38	3.39	3.54	6.96	6.96	12.69	19.75	19.82	10.98	20.19	20.18	-17.69	-6.79
PC07	1.45	1.47	1.47	0.66	2.04	2.04	2.65	0.85	0.84	0.60	0.76	0.76	-3.01	-3.83
PC08	2.04	1.04	0.96	0.50	0.47	0.47	1.75	1.24	1.25	0.70	0.54	0.53	-0.24	-0.96
PC09	0.88	0.60	0.60	0.81	0.74	0.74	0.82	0.30	0.30	0.27	0.29	0.28	-0.09	-0.43
PC10	0.80	0.49	0.51	0.46	0.39	0.40	0.96	0.49	0.49	0.49	0.33	0.32	0.03	-0.31
PC14	0.46	0.49	0.46	1.12	0.49	0.51	1.22	0.27	0.28	1.92	0.23	0.24	-0.02	0
PC17	4.69	1.40	1.42	3.10	3.08	3.10	0.89	3.00	3.05	0.52	7.17	7.20	-5.48	2.88
PC19	2.55	3.74	3.71	3.78	11.05	11.06	5.94	7.53	7.52	5.33	2.67	2.69	-9.64	-10.84
PC23	1.50	1.55	1.50	1.36	13.58	13.61	5.03	6.32	6.32	5.80	18.78	18.81	-14.46	-9.91
PC27	3.37	13.03	13.01	4.09	21.23	21.13	1.53	7.59	7.61	1.52	13.92	13.86	-17.48	-26.68
PC28	0.98	7.42	7.51	2.27	19.65	19.55	2.59	9.08	9.19	1.14	26.58	26.44	-32.96	-24.79
PC29	1.33	8.92	8.93	1.67	11.86	11.78	7.14	28.83	28.81	9.79	36.85	36.70	-48.51	-15.57
MEAN	1.81	3.16	3.16	1.74	6.58	6.57	3.15	6.14	6.15	2.88	9.21	9.19		
MEDIAN	1.45	1.47	1.47	1.36	3.08	3.10	1.75	3.00	3.05	1.14	2.67	2.69		

Figure S3.1. Root Mean Square Errors (RMSEs) for each pairing strategy at Pie de la Cuesta Landslide with campaign GNSS field displacement as references. 14 GNSS points have been compared to the six pairing strategies. The strategy that performed best is the combining MGM algorithm with short term pairs (MGM-ST). The red boxes show the worst strategy (dark red) and the second worst (light red) strategy, while the blue boxes show the second-best (light blue) and the best (dark blue) strategy for each component and for each measurement point.

5 S4 Time-series of displacement at Pie de la Cuesta landslide for different velocities

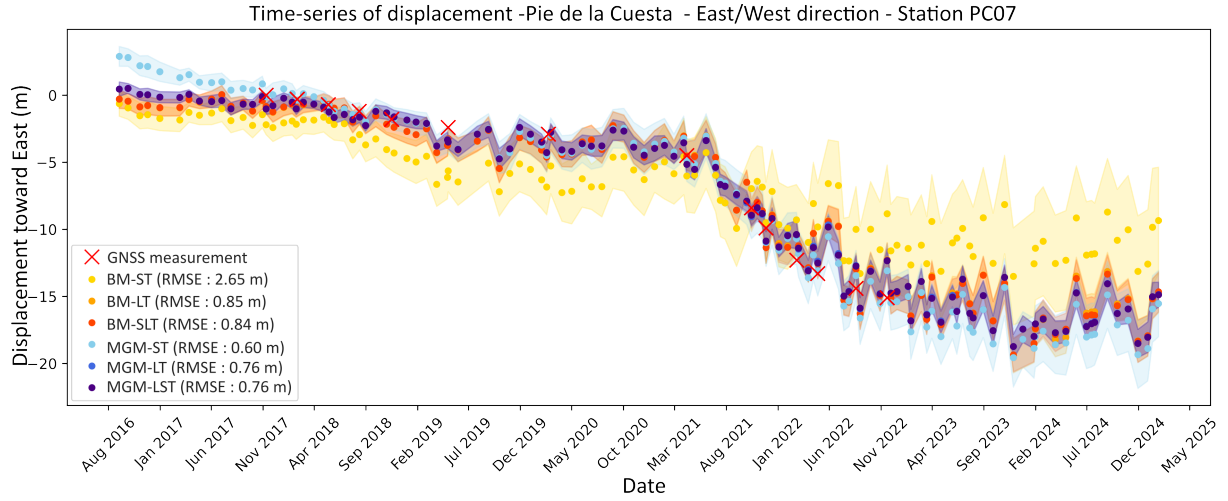


(a) Time-series of displacement in EW direction.

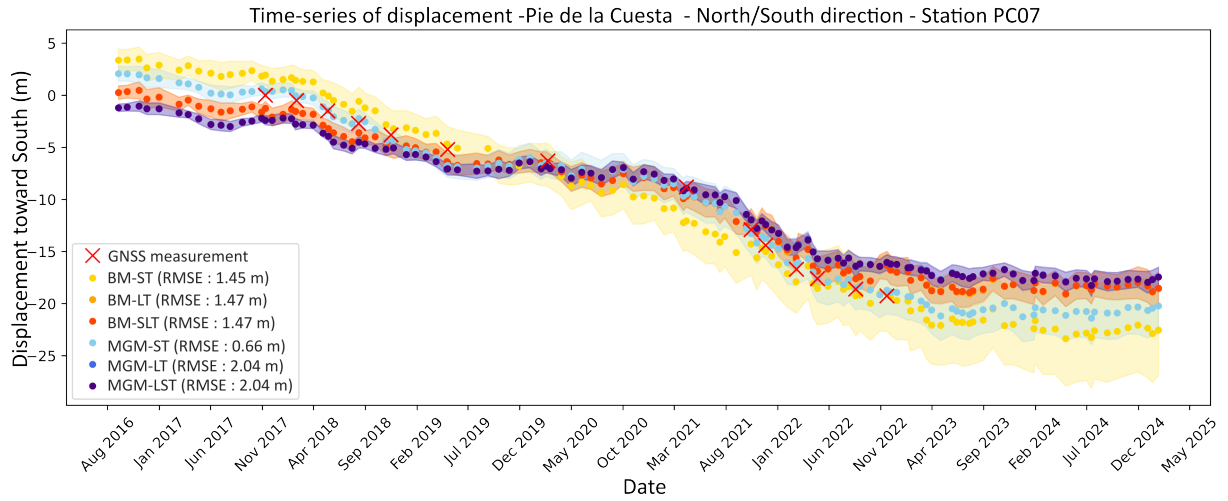


(b) Time-series of displacement in NS direction.

Figure S4.1. Time-series of displacement for NS and EW component, for point PC01, located in a low speed area. Strategies using long-term pairs (LT and LST) perform better than ST strategies, while, for each strategy that uses the same pairs, the MGM algorithm gives better results than the BM algorithm. The standard deviations are smaller for the MGM algorithm than for the BM algorithm.



(a) Time-series of displacement in EW direction.



(b) Time-series of displacement in NS direction.

Figure S4.2. Time-series of displacement for NS and EW component, for point PC07 located in a medium speed area. The best strategy for tracking the acceleration of the landslide at PC07 in both directions is the MGM-ST strategy.

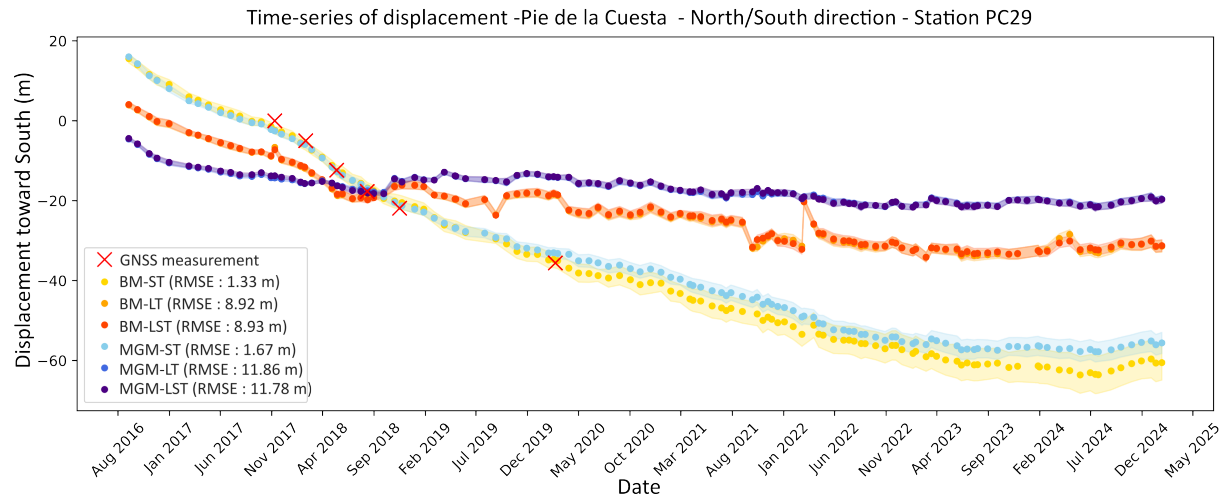


Figure S4.3. Time-series of displacement for point PC29 in NS direction located in a high speed area. The time series of displacements in the EW direction is presented in the article, in Figure 8.

S5 RMSE against velocities for Maca landslide

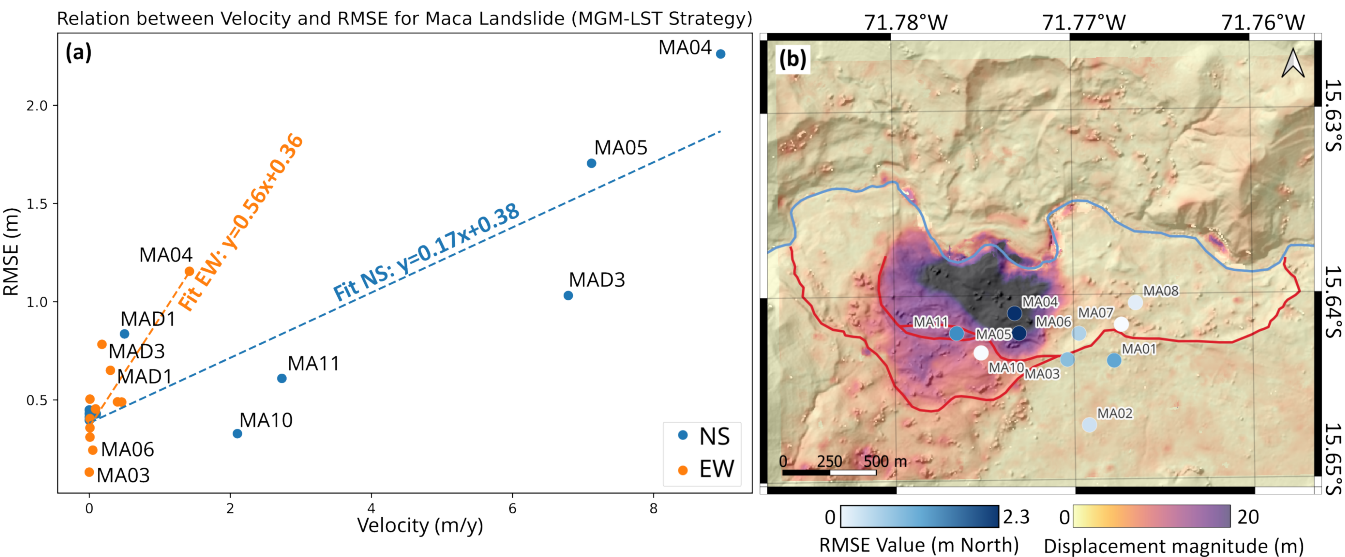


Figure S5.1. Relationship between the velocity and RMSE values from PlanetScope image correlation for the East-West (EW) and North-South (NS) components at Maca Landslide (a). (b) Map illustrating the MGM-LST strategy's velocity, where the highest RMSE values are found where the velocity is higher