

Multi-annual InSAR solution of vertical land motion in 2021 lethal building collapse site in Miami

Xiao Yu ¹, Xie Hu ²

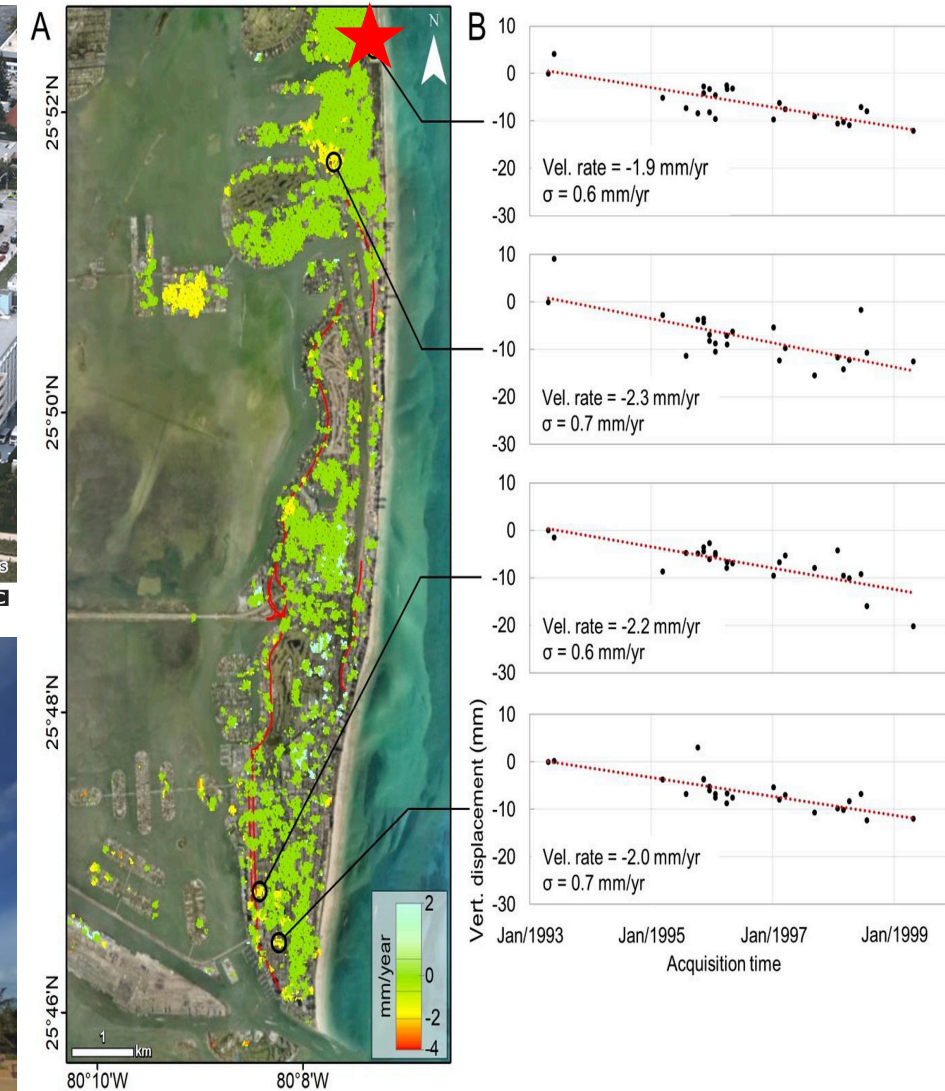
1 Department of Earth and Atmospheric Sciences, University of Houston, TX, USA

2 College of Urban and Environmental Sciences, Peking University, Beijing, China



Building collapse site in Miami

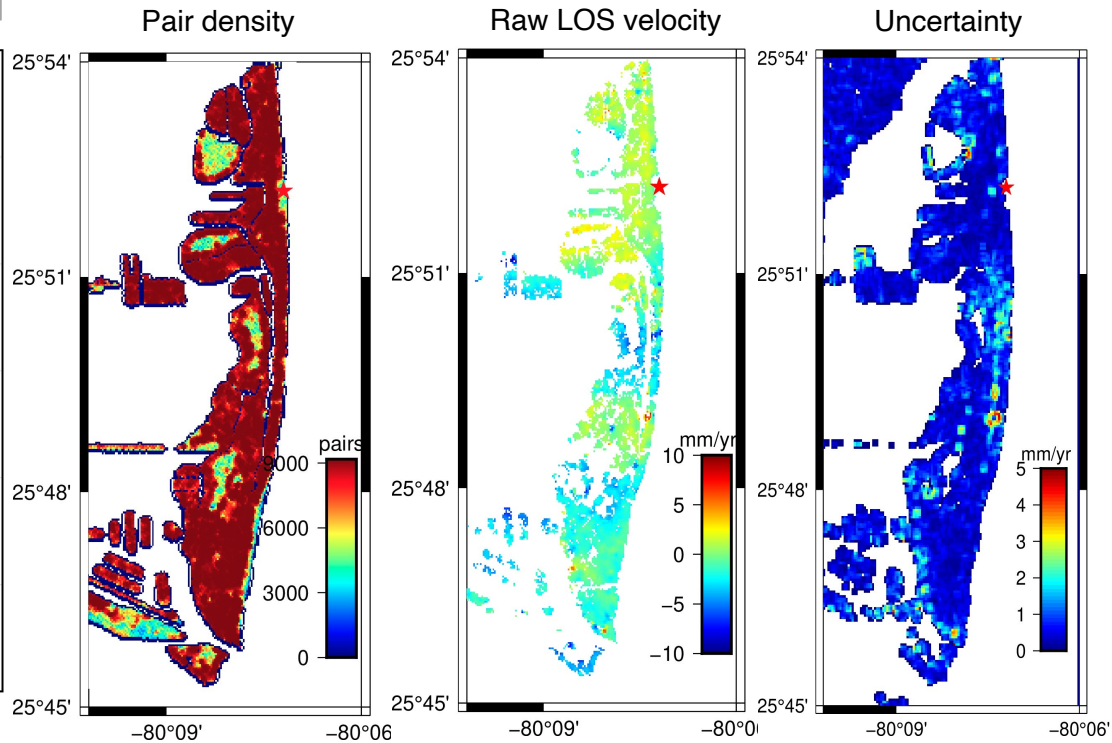
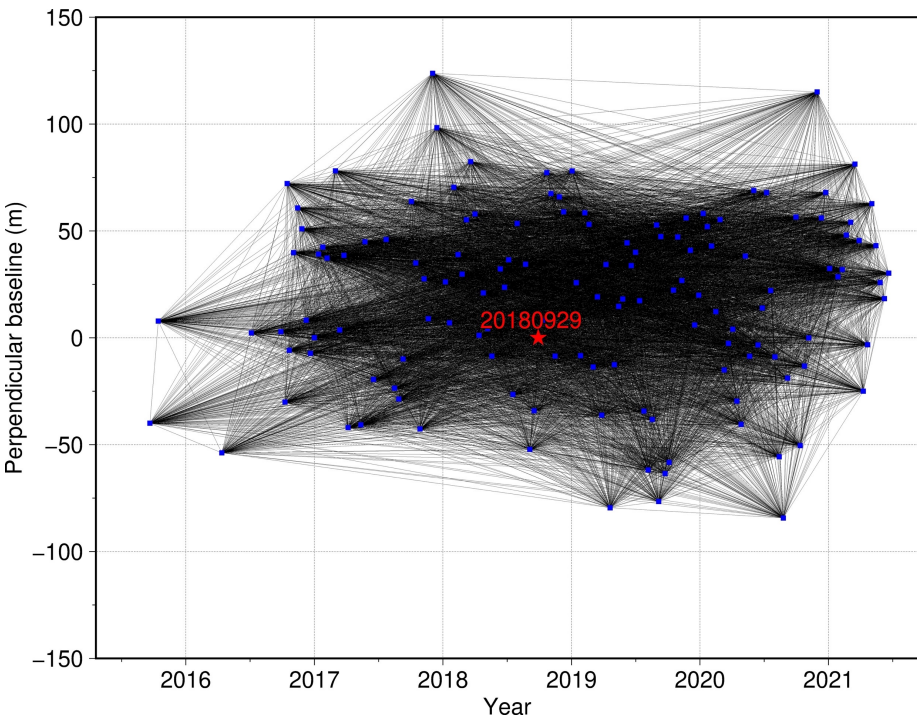
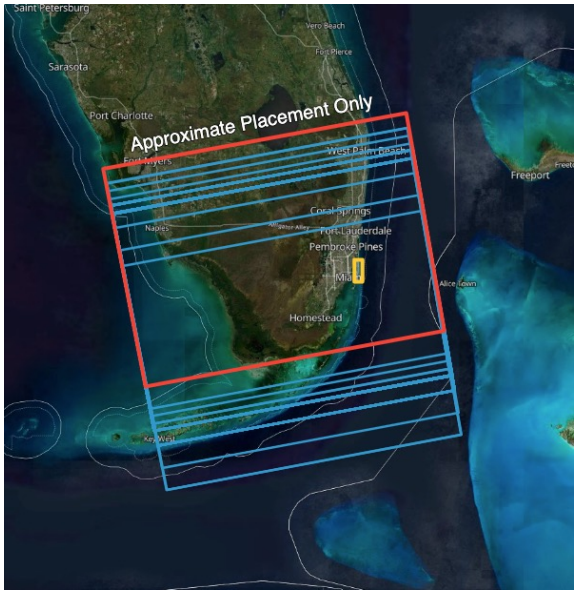
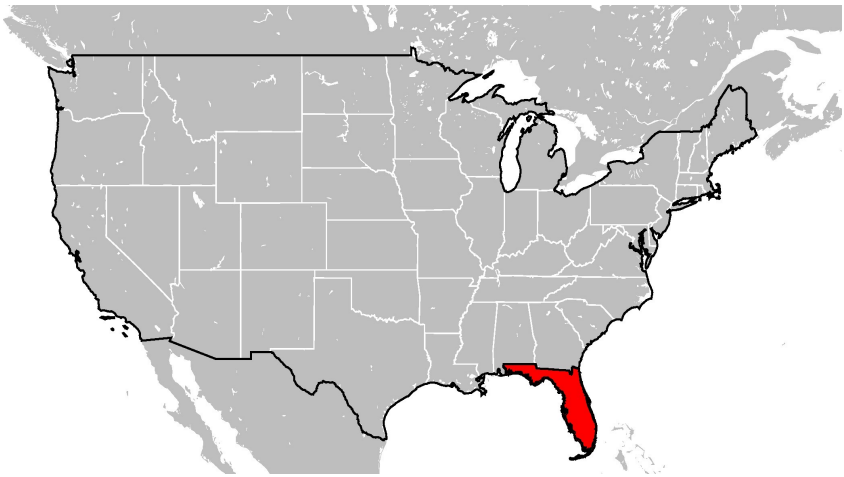
- Location: Champlain Towers South condominium, Miami Beach surfside
- $25^{\circ}52'23''\text{N}$; $80^{\circ}07'15''\text{W}$
- Time: June 24, 2021, at approximately 1:22 a.m. EDT
- Rank the third deadliest structural engineering failure (98 deaths)



(Fiaschi & Widowski, 2020)

Sentinel-1 Data Networks

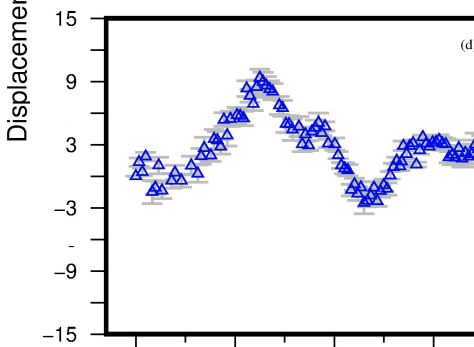
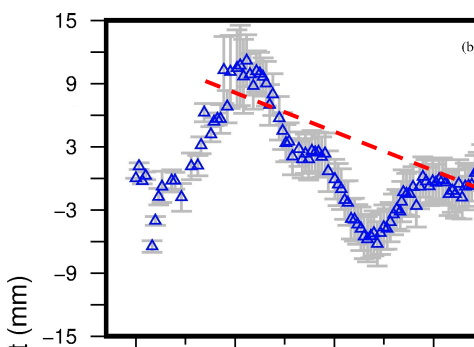
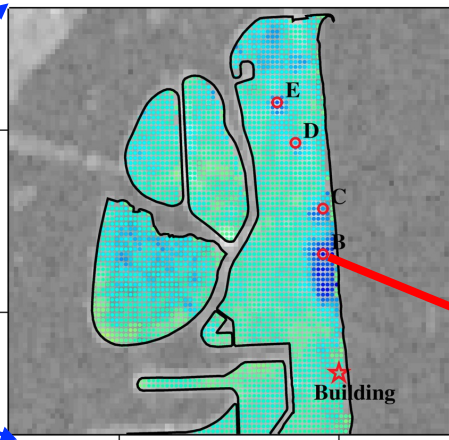
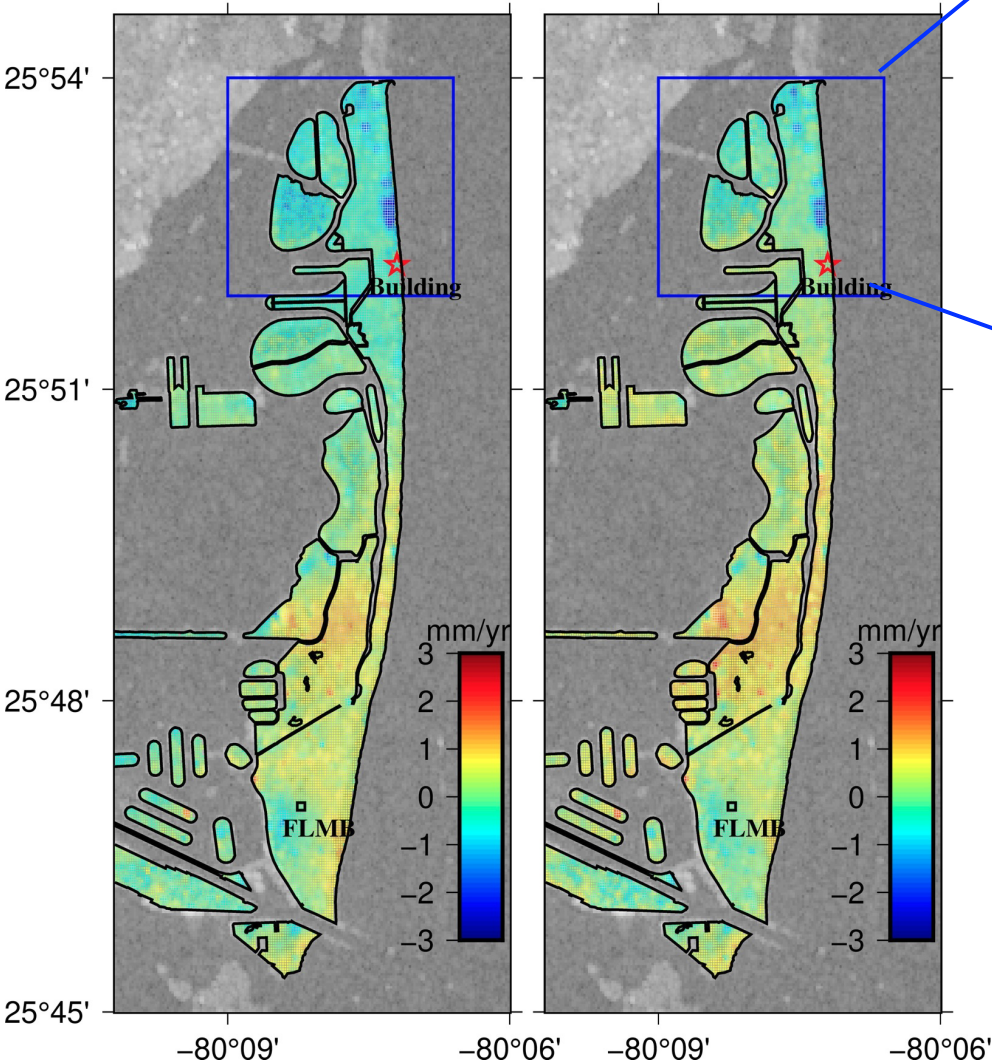
Path: 48
Direction: Ascending
Frames: 77-80
SAR scenes: 141
Time length: 2015~2021
Connectivity: Brute-force approach
IFGs: $141 \times 140 / 2 = 9,870$
Reference image: 09/29/2018
Multi-look (range/azimuth): 8/2



➤ Does the building subside at the observation period?

Stacking LOS Vel

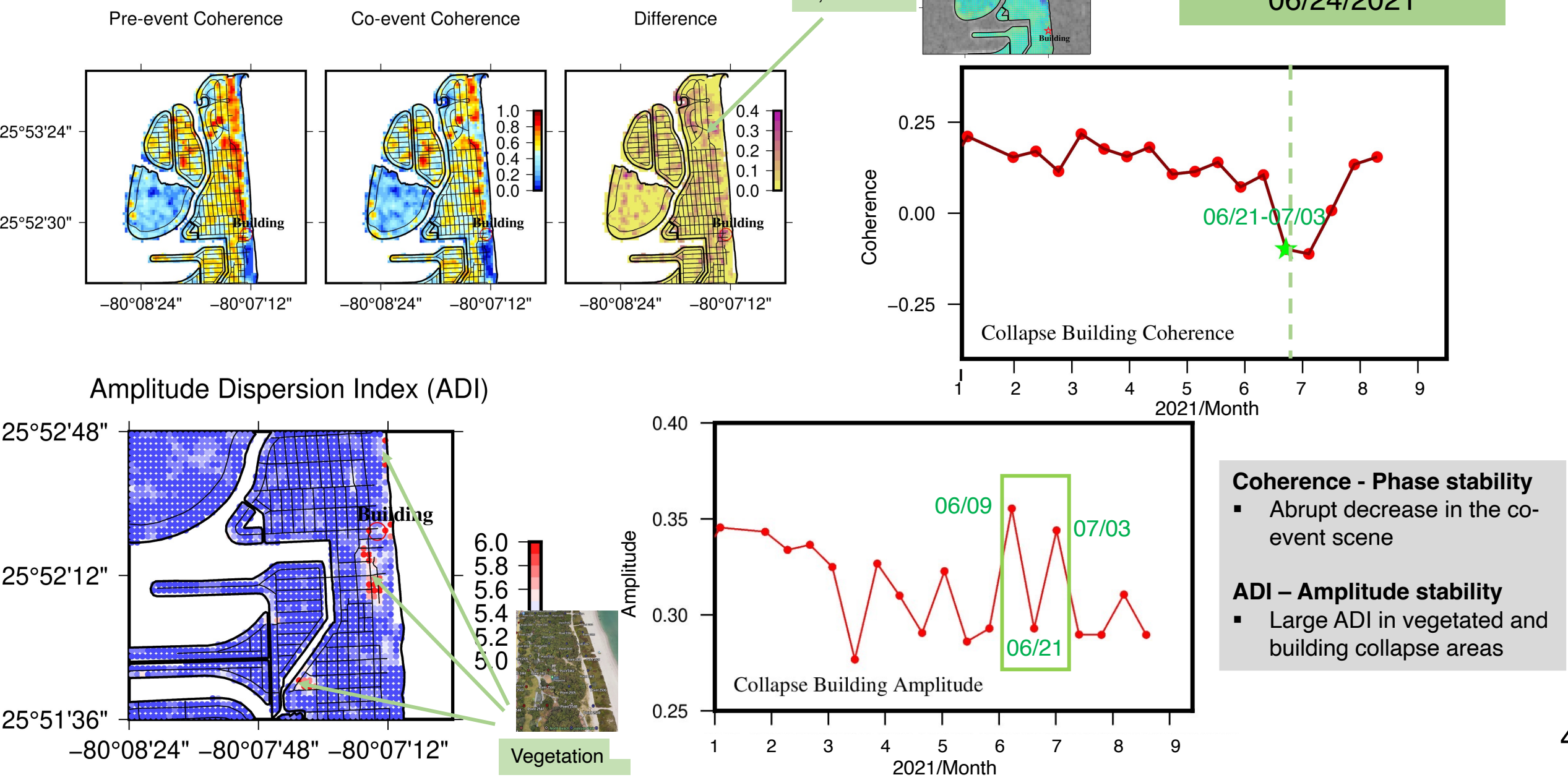
SBAS LOS Vel



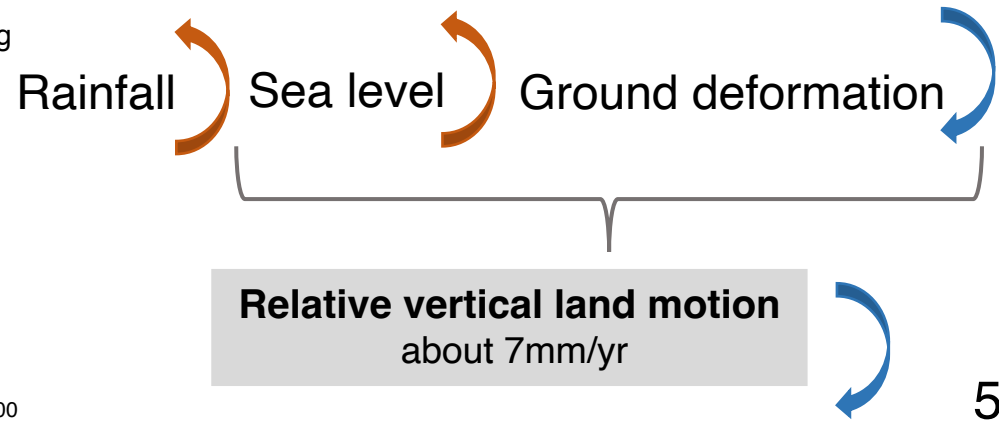
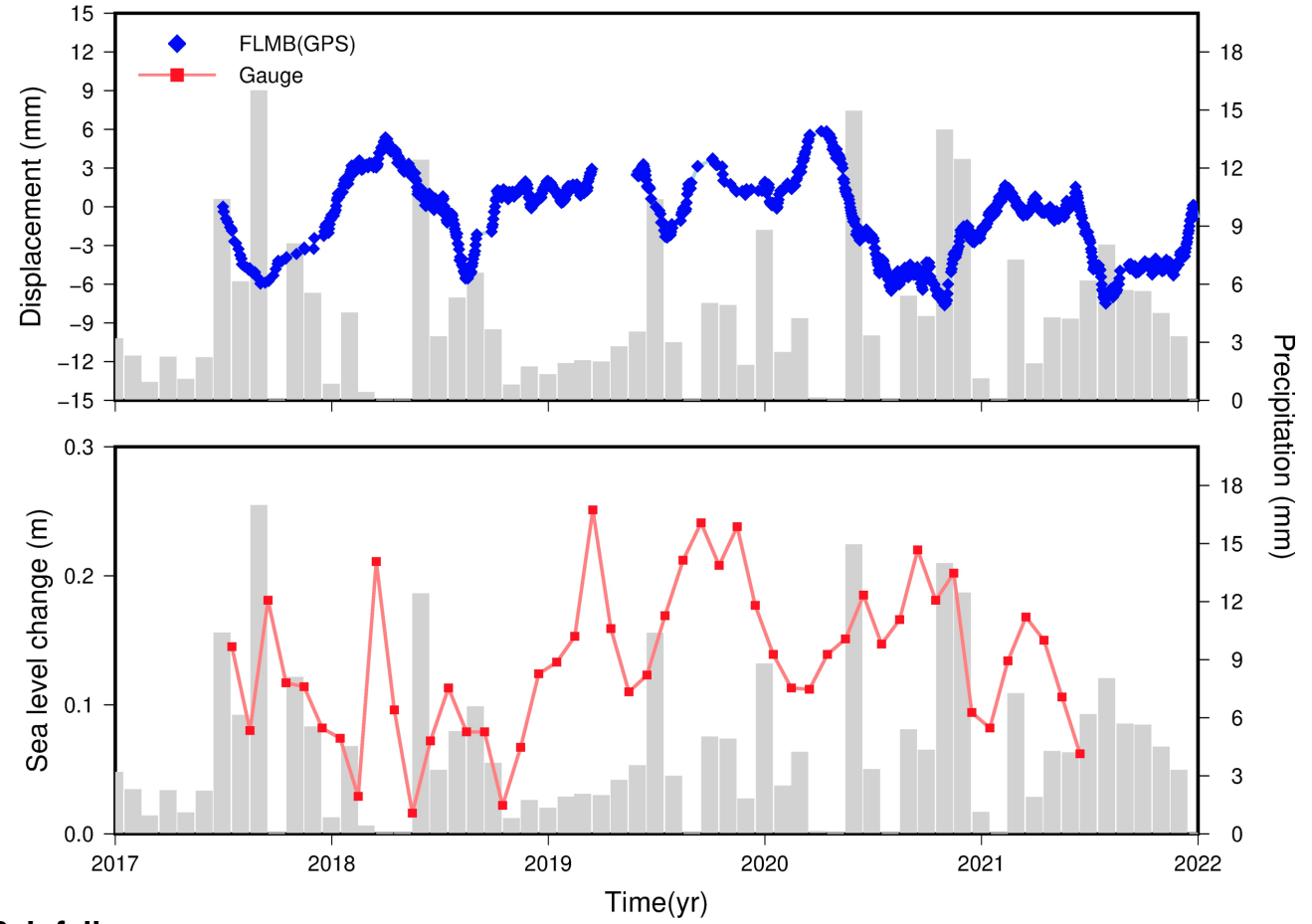
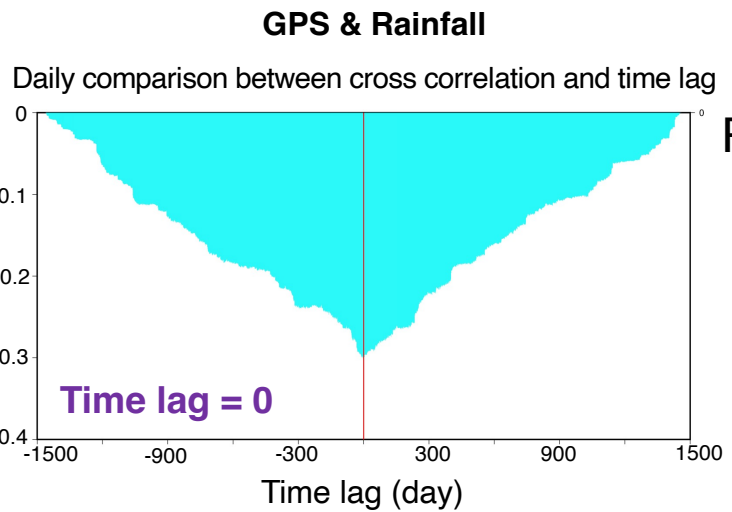
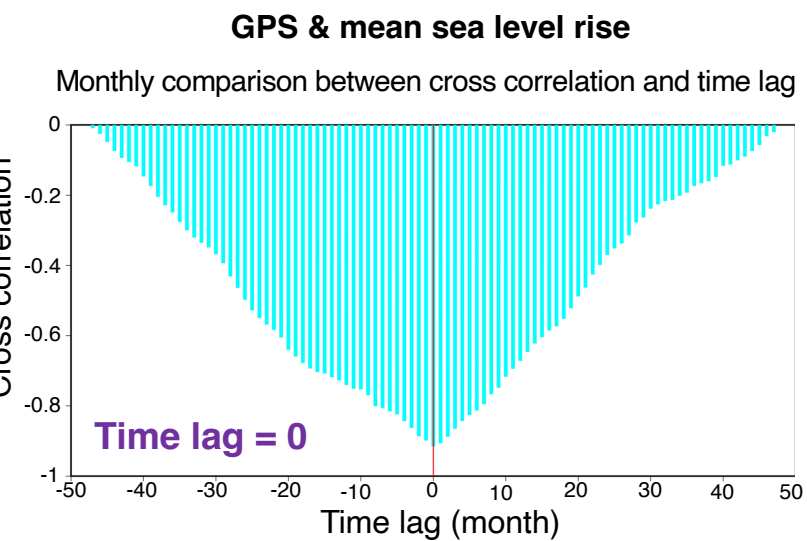
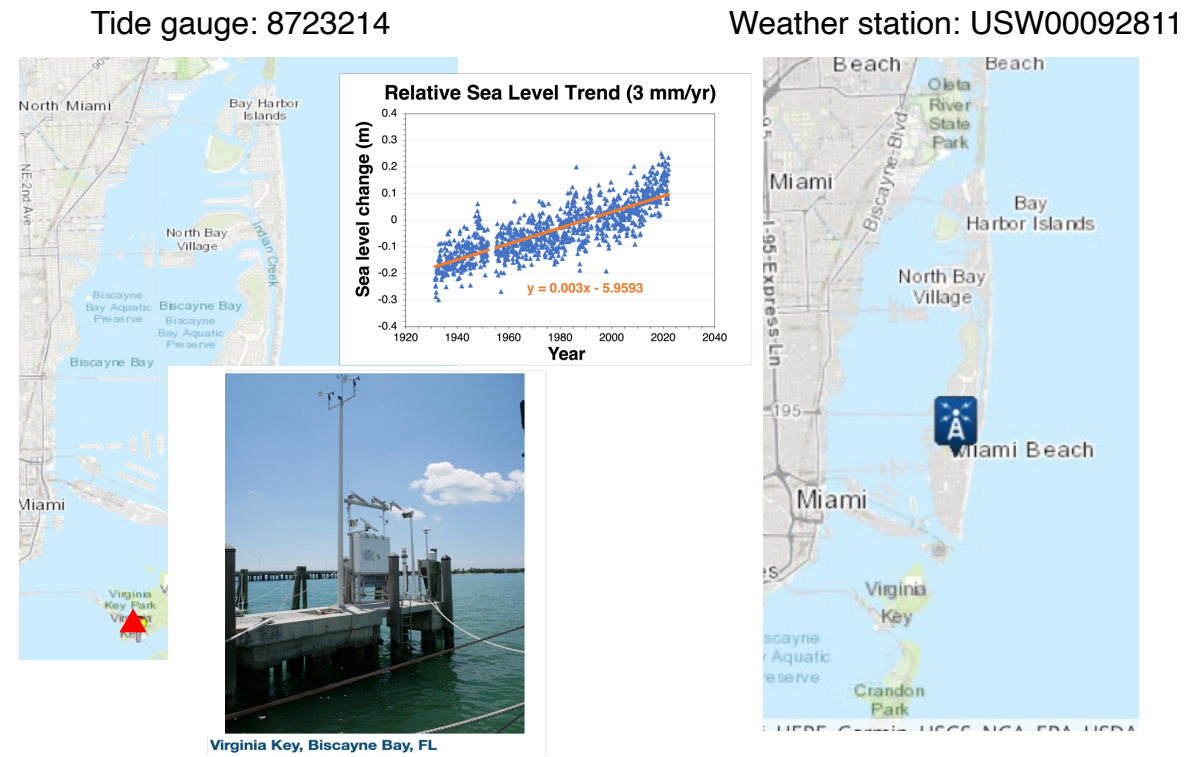
- Tymofeyeva, E., & Fialko, Y. (2015). Mitigation of atmospheric phase delays in InSAR data, with application to the Eastern California Shear Zone. *Journal of Geophysical Research: Solid Earth*. 120.
- Zheng, Y., Zebker, H., & Michaelides, R. (2021). A New Decorrelation Phase Covariance Model for Noise Reduction in Unwrapped Interferometric Phase Stacks, "in *IEEE Transactions on Geoscience and Remote Sensing*, 59(12), 10126-10135.

Year

➤ Can we observe the sudden changes in coherence and amplitude time series?



➤ Relationship to precipitation and sea level trend



Summary

- **Brute-force time series approach** can effectively reduce the long-/short-wavelength artifacts.
- Identify several localized subsidence at >1.5 mm/yr.
- No evident precursors for the collapsed building.
- SAR coherence and amplitude changed abruptly spanning the time of collapse.
- Coastal subsidence hastens the inundation during sea level rise.

Acknowledgement

