

# Analysis of Surface Deformation in Beverly Hills, California: 2015-2023

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This study presents a comprehensive analysis of surface deformation in Beverly Hills, California, between March 2015 and January 2023. We processed 289 Sentinel 1 A/B SAR images (ascending path 64) and 291 Sentinel 1A/B SAR images (descending path 71) and formed interferograms with a maximum connection level of 10. We unwrap the interferograms using the SNAPHU algorithm, and a time-series analysis is performed for both the ascending and descending track using MintPy. We proceed to correct atmospheric effects with the ERA5 weather model and small baseline bias using the cumulative closure phase. Given the small size of the study region, the spatial variation of both ionospheric phase delays and plate motion are considered negligible. We then decompose ascending and descending InSAR time-series into linear, seasonal (allows varying seasonal components), and transient components using DISSTANS. For each component, we construct a vertical and horizontal deformation map by combining the ascending and descending tracks and assuming no displacement in the direction that is parallel to the Santa Monica Thrust fault.

Our study has identified three areas of interest, marked in the attached figure. Bounded in the north by the Hollywood fault and in the south by the Santa Monica Thrust fault, we identify an area of steady secular uplift punctuated by episodic subsidence. South of the Santa Monica Thrust fault, we identify an area of secular subsidence. Seasonal signals are concentrated in a small pocket of areas that generally do not overlap with either deformation zones. We discuss possible mechanisms for these observed signals (hydrological/tectonic) and their implications.

