SAGE/GAGE Abstract

Title: Surface deformation surrounding the 2021 M7.2 Haiti earthquake illuminated by InSAR observations

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Abstract:
Earthquakes pose a major threat to Haiti, as experienced in the catastrophic M7.0, 2010 earthquake (USGS, 2010), and more recently in the M7.2 earthquake in 2021 (USGS, 2021). These events both occurred within the Enriquillo Plantain Garden Fault Zone (EPGFZ), a left-lateral strike-slip fault zone which runs through the southern peninsula of Haiti and is a major source of seismic hazard for the region. Neither earthquake ruptured a ~40km section of the intervening EPGFZ between the two event rupture planes, raising the question of whether this unruptured segment is seismically loaded and therefore hazardous or if it is accommodating strain in some other way. In this work, we use satellite-based InSAR (Interferometric Synthetic Aperture Radar) techniques to illuminate ground deformation patterns surrounding the 2021 event. These observations are particularly important due to the scarcity of field observations in Haiti during and after the most recent earthquake. In this work we use Sentinel-1 and ALOS-2 InSAR data to show: 1) the event's coseismic deformation field using Line-of-Sight data; 2) detailed fault structures illuminated by phase gradient techniques, not previously used in highly vegetated regions like Haiti; and 3) post-seismic migrating shallow creep occurring on the unruptured section of the EPGFZ, which persists for weeks following the earthquake.

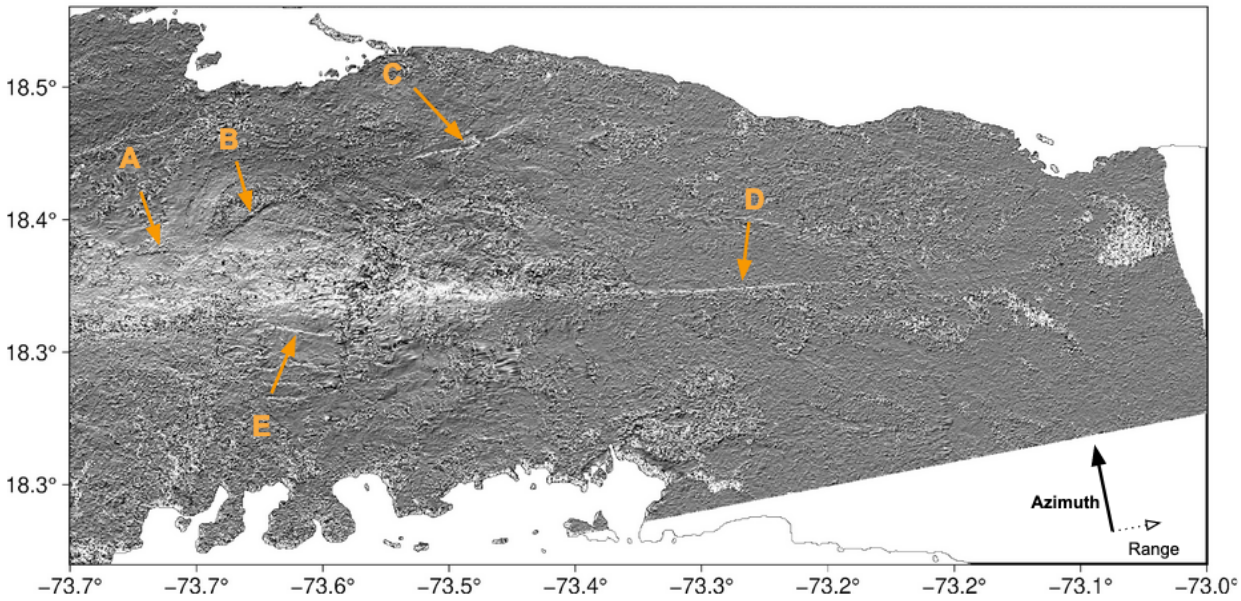

Figure 1. Plot of phase gradient in the azimuth (flight) direction. The phase gradient highlights areas of discrete offsets in the phase, indicating localized strain, without the need for phase unwrapping. Linear features of interest are labeled A-D and exhibit a wide variety of locations

(both on and off-fault), orientations, and polarities. Feature D is also observed as prograde post-seismic deformation in wrapped phase interferograms.