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Monitoring Severe Storm Impacts and Climate Trends in the Southeastern US using Satellite-Based Proxy Indicators: A Case Study of Hurricane Sally

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The southeastern U.S. is frequently impacted by severe thunderstorms, which are known for producing damaging winds, hail, and tornadoes. The National Oceanic and Atmospheric Administration (NOAA) reports that this region experiences the highest frequency of thunderstorms in the country. In recent decades, these storms have shown a trend of increasing both in frequency and intensity. Moreover, the southeastern states are susceptible to hurricanes and tropical storms, which have been intensifying due to warmer ocean temperatures. The escalating severity of these weather events poses significant risks to public safety, infrastructure, and the economy in the southeast. Our proposed study uses advanced satellite technology, specifically Interferometric Synthetic Aperture Radar (InSAR), to map storm-induced flooding and damage from October 2019 to August 2021. This period includes Hurricane Sally, which caused significant destruction in Alabama on September 16, 2020. By analyzing satellite images taken before and after hurricanes, we aim to identify affected areas and assess infrastructural damage. The study employs Sentinel-1 InSAR data processed by the COMET-LiCSAR system and the LiCSBAS processing package, generating surface deformation time series. We also integrate optical images to examine soil moisture and climate changes, correlating them with displacement and radar coherence data from SAR images. This research will classify and discuss the impact of hurricanes on infrastructure and roadways, providing critical information to prioritize emergency response and inform repair and reconstruction planning.