Multi-Sensor Remote Sensing Captures Stable-to-Unstable Sliding Transition of the 2017 Mud Creek Landslide, Big Sur, California

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Landslides are major hazards that have significant implications for the natural and human-made environment worldwide. A key goal in remote sensing monitoring of landslides is to provide information on the timing and extent of landslides before they cause major damages or claim lives. Here we use satellite and airborne radar and optical data to capture the stable-to-unstable transition of the 2017 Mud Creek landslide, Big Sur, California. We show that by using information from multiple sensors we can identify the location, timing, and size of the Mud Creek landslide years before it failed catastrophically. We found that InSAR analysis allowed for the detection of slow (cm/yr) motion up to 8 years prior to failure. We were also able to use satellite and airborne InSAR together to constrain the 3D surface velocity, which allowed us to invert for the subsurface geometry of the landslide. While the InSAR provided key information on the slow motion and geometry of the landslide, it was unable to accurately measure the large deformations leading up to runaway failure. However, pixel offset tracking of PlanetScope optical images revealed the landslide accelerated in a predictable way, several weeks before failure. Our data provide key information that can be used to better understand landslide mechanisms, and also show that there is potential for forecasting devasting landslides before they occur.