

## Geodetic Network Expansion during the 2018 Kīlauea Eruption

By: Sarah Conway (USGS-HVO), Ingrid Johanson (USGS-HVO), Brian Shiro (USGS-HVO) Asta Miklius (USGS-HVO), Brian Meyers (USGS-CVO), Rebecca Kramer (USGS-CVO)

The 2018 eruption of Kīlauea Volcano provided a unique challenge for staff at the USGS Hawaiian Volcano Observatory (HVO). Fissure eruptions in the lower East Rift Zone (LERZ) and caldera collapse at the summit required rapid densification of the geodetic and seismic monitoring networks. With help in part from an equipment loan from UNAVCO, we deployed a total of 33 campaign GNSS stations and 8 semi-permanent telemetered stations. Six of the telemetered GNSS stations co-located geodetic and seismic instruments and used HVO's rapid deployment power system to support real-time data streaming with cellular modems. The expanded network filled important monitoring gaps in the LERZ (near the erupting fissures), densified Kīlauea's summit network, and captured postseismic deformation from the May 4, 2018 M6.9 earthquake. By the end of the eruption, lava flows inundated three continuous stations in the LERZ and three geodetic stations were lost to crater collapse at the summit.

As the eruption continued there was an identified need for campaign stations to operate long-term and at higher data rates with frequent visits to collect data. For the campaign occupations, the number of deployments and remoteness of the sites required us to modify our standard operating procedures. In particular, power loss led to patchy data recovery during the prolonged eruption period. In response, we upgraded campaign GPS units with a 105 amp hour battery and 20 watt solar panel to withstand deeper battery discharge cycles. Other challenges included long in-person download times for 1 Hz data from non-telemetered stations. We mitigated this by using USB drives and changing download data format to drastically reduce the download times for each station. Equipment corrosion was another common problem, due to the high concentrations of corrosive volcanic gases. Despite the challenges, the additional network density provided by the campaign stations contributed to an extraordinary data set that captured the unprecedented events of 2018 at Kilauea Volcano.

