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STATEMENT OF PURPOSE:

More than 70% of the Earth's volcanic output happens underwater. However, the hazards posed by shallow submarine silicic eruptions are relatively poorly understood, partially due to limited observations from these remote settings. In July 2012, the discovery of a large pumice raft floating between Tonga and Auckland spurred an exceptionally thorough exploration of the eruptive products from a submarine silicic eruption. Moderate-Resolution Imaging Spectroradiometer (MODIS) images elucidated the production and dispersal of a 400-km² pumice raft, which initially covered >2x the areal extent of Washington D.C. Ship-based bathymetric maps collected before and after July 2012 initially suggested new bathymetric features were produced by explosive eruptions from multiple vents. However, a comprehensive 1-m resolution bathymetric map produced by the autonomous underwater vehicle (AUV) Sentry along with 250 hours of video and 290 samples collected by the remotely operated vehicle (ROV) Jason revealed a new, dominantly effusive picture of the eruption. The high-resolution mapping and sampling illuminated new lava flows and domes produced from 14 vents, along with giant pumice blocks spread across the caldera. The distribution of giant pumice blocks provided new insight into submarine fragmentation processes and pyroclast transport and deposition. The mass partitioning calculated from the satellite images of the pumice raft and bathymetric maps of seafloor products revealed that the vast majority of the erupted volume was rafted away from the volcano. Thus, the large magnitude of this submarine eruption could not have been recognized without fortuitous detection from the air and satellite remote sensing of the pumice raft.

DESCRIPTION OF DATA SETS:

The following data sets were used: 1) MODIS Terra and Aqua satellite images were acquired from the Level-1 and Atmospheric Archive and Distribution System (LAADS) Distributed Active Archive Center (DAAC) 2) Ship-based bathymetry was collected by the R/V Tangaroa in 2002 and 2012. The data are used with permission from PI R. Wysoczanski (NIWA). 3) Post-eruption coarse resolution (25-m) bathymetry, ROV Jason samples and observations, and AUV Sentry bathymetric maps were collected during an R/V Revelle cruise in 2015. All data are used with permission from PI's R. Carey (UTas) and S. A. Soule (WHOI).