Slip Rate of the Hosgri Fault Based on the Sedimentary Record of Plio-Quaternary Sediments within a Right-Stepping Extensional Pull-Apart

Ronald N. McGinnis, John A. Stamatakos, Alan P. Morris, David A. Ferrill, Kevin J. Smart, and Miriam R. Juckett; Southwest Research Institute, San Antonio, TX.

In 2015, Pacific Gas & Electric (PG&E) completed a seismic source characterization to assess the seismic hazard at the Diablo Canyon Power Plant (DCPP), in which the Hosgri fault was identified as the dominant seismic source. PG&E characterized the fault primarily from submarine mapping from seismic reflection images and single-channel, high-resolution sparker data. As part of our support to the U.S. Nuclear Regulatory Commission's review of PG&E's probabilistic seismic hazard analysis (PSHA) for the DCPP, we evaluated the slip rate on the Hosgri fault by analyzing the growth of sediments within an extension pull-apart that formed a few kilometers offshore, where slip is transferring from the Hosgri to the San Simeon fault. As the pull-apart developed, sediments accumulated along the bounding "Half Graben fault," infilling the available volume created by the extension generated by the horizontal component of Hosgri fault displacement. For the analysis, we relied on four previously identified Plio-Quaternary unconformities in the sedimentary section that were based on correlations to the global eustatic sea-level cycles. We analyzed these unconformities on 24 profiles of seismic images along the Half Graben fault. Our results show an increase in slip rate for the Hosgri fault from 0.21 mm/yr in the Pliocene to 2.17 mm/yr in the late Quaternary. The late Quaternary rate is consistent with the slip rate of the Hosgri fault used in the PG&E PSHA. The increase in slip rate from the Pliocene to the late Quaternary may simply represent an increase in activity on the Hosgri fault in the late Quaternary, or it may represent increasing cooperation and fault-linkage between the Hosgri and San Simeon faults as these faults grow, propagate laterally such that their fault tips overlap, and begin to behave as a single linked fault system.

Abstract for 2017 Seismological Society of America Annual Meeting (April 18-20, 2017, Denver, CO), Special Session "*Integrated and Geophysical Investigations for Site Characterization of Critical Facilities and Infrastructure*."