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CHARACTERIZATION OF BLIND SEISMIC SOURCES IN THE MT. DIABLO-LIVERMORE REGION, SAN FRANCISCO BAY AREA, CALIFORNIA

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ABSTRACT

This study presents new data and analyses to characterize a blind thrust fault beneath Mt. Diablo anticline, eastern San Francisco Bay area, as a potential seismic source. Mt. Diablo anticline is the largest contractional structure in a belt of right-stepping, *en echelon* folds and thrust faults formed in a restraining stepover between the dextral Greenville and Concord faults. Based on construction of preliminary balanced cross sections, Unruh and Sawyer (1997) interpreted that Mt. Diablo anticline is an asymmetric, southwest vergent fault-propagation fold developed above a blind, northeast-dipping thrust fault. Stratigraphic relations in the Tassajara Hills southwest of Mt. Diablo suggest that most, if not all, of the fold growth has occurred in the past 5 Ma. Based on estimates of total horizontal shortening across Mt. Diablo anticline, Unruh and Sawyer (1997) proposed that the long-term average slip rate on the blind thrust fault may be as high as 7 mm/yr. This estimate was based, in part, on the assumption that antiformal relief on Cretaceous and Eocene strata across the fold is entirely due to late Cenozoic growth of Mt. Diablo. New data obtained from exploration wells and apatite fission-track analysis for this study show that substantial structural relief existed on pre-Neogene strata prior to late Cenozoic growth of Mt. Diablo anticline. By constructing new balanced cross sections that honor independent constraints on subsurface structure and maximum rock uplift during folding, the revised maximum reverse slip on the blind Mt. Diablo thrust fault is 8 km, which is lower than the previous maximum slip estimate of Unruh and Sawyer (1997). If folding began between about 6.2 Ma and 3.3 Ma, then the long-term average slip rate on the Mt. Diablo thrust fault is about 1.3 mm/yr to 2.4 mm/yr. The modern slip rate could be faster than 2.4 mm/yr if shortening began after 3.3 Ma, or if the shortening rate has increased during the late Quaternary.