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MAFIC AND ULTRAMAFIC INCLUSIONS ALONG THE SAN ANDREAS FAULT SYSTEM: THEIR GEOPHYSICAL CHARACTER AND EFFECT ON EARTHQUAKE BEHAVIOR, CALIFORNIA, USA

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Mafic and ultramafic rocks along the San Andreas Fault System (SAFS) influence earthquake processes where their geologic setting often provides information on the tectonic evolution of these large-scale strike-slip faults. In the northern part of the SAFS, along the Hayward Fault (HF), inversion of gravity and magnetic data indicate that seismicity avoids the interior of a large gabbro body and mechanical models may be able to explain how this massive mafic block influences the distribution of stress. Aftershocks of the M6.7 1989 Loma Prieta earthquake are also spatially related to the distribution of a gabbro body, clustering along the SAF and terminating at the NW end of the gabbro body where it abuts the fault surface. Based on geophysical modeling and a three-dimensional view of the subsurface geology and seismicity, aftershocks do not occur in the interior of the buried gabbro body.

In the southern part of the SAFS, aftershocks and ruptures of the M7.1 1999 Hector Mine and M7.3 1992 Landers earthquakes avoid the interior of a Jurassic diorite that extends to depths of approximately 15 km and was probably an important influence on the rupture geometry of the these earthquakes. Seismicity prior to the Landers earthquake also tend to avoid the diorite, suggesting that it affects strain distribution. The San Jacinto Fault (SJF), a discontinuity within the Peninsular Ranges batholith (PRB), separates mafic, dense, and magnetic rocks of the western PRB from more felsic, less dense, and weakly magnetic rocks of the eastern PRB. The geophysical gradients do not cross the SJF zone, but instead bend to the northwest and coincide with the fault zone. Because emplacement of the PRB presumably welded across this

older crustal boundary, the SJF zone probably developed along the favorably oriented margin of the dense, stronger western PRB. Two historical M6.7 earthquakes may have nucleated along the PRB discontinuity suggesting that the PRB may continue to affect how strain is accommodated along the SJF zone.

Improved understanding of the three-dimensional geometry and physical properties along the SAFS will provide additional constraints on seismic hazard probability, earthquake modeling, and fault interactions that are applicable to major strike-slip faults around the world.