EMPLOYING MIDDLE MIOCENE MAFIC DIKE ORIENTATIONS IN THE EASTERN SAN GABRIEL MOUNTAINS TO RESOLVE MIOCENE EMLACEMENT STRESS REGIMES AND CENOZOIC BLOCK ROTATIONS

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The San Gabriel Mountains expose a collection of Precambrian to Late Cretaceous igneous and metamorphic rocks intruded by Late Oligocene and Middle Miocene plutons and dikes. Henceforth the region was fractured and dismembered by dextral and sinistral strike-slip faults beginning with late Miocene initiation of the right-lateral San Gabriel. The Late Cenozoic intrusions and faults record a complex evolution of stress regimes, magmatism, and transrotational strain that accompanied larger-scale development of the transform plate boundary in southern California. Our study focuses on the middle-Miocene mafic-intermediate (basalt to andesite) dike swarm that is ubiquitous north and south of the San Gabriel Fault with the exception of Ontario Ridge. These dikes are significant because they intruded during early-stage rotation of the Western Transverse Ranges and opening of the Los Angeles basin to the south and west but predate the onset of conjugate strike-slip faulting that altered original dike swarm geometries. Therefore, these dikes may record middle Miocene emplacement stresses and further serve to track subsequent block rotations within the San Gabriel Mountains. Previous studies used the dikes as offset features to create Miocene paleogeographic reconstructions of the region, however, this study utilizes dike orientation measurements recorded between 1992 to 1998 to analyze stresses and block rotations. UTM coordinates were assigned to ~350 measurement locations to create a detailed GIS map of dike orientations in the study area. Additional measurements were taken in remote areas north of the San Gabriel fault that lacked data. Preliminary results reveal that north of the fault, dikes exhibit a unimodal N35±15W average strike suggesting emplacement in an extensional stress regime. However, south of the San Gabriel fault, trimodal dike trends of N60±30W, N5±5E, and N40±15E indicate a more convoluted history of emplacement along conjugate shear fractures during block rotation. Mafic dike orientations in the eastern San Gabriel Mountains are thus helpful in providing quantitative constraints on stress evolution and displacements associated with regional transtension and transrotation.