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TITLE: Finite Element Analysis Of Structural And Magmatic Interactions At Mono Basin (California)

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CURRENT SESSION: G03. The Art and Science of Volcano Geodesy

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ABSTRACT BODY: Mono Basin is a northward trending graben situated east of the Sierra Nevada and west of Cowtrack Mountains, extending from the northern edge of Long Valley Caldera towards the Bodie Hills. From a hydrographic perspective, the Mono Basin is defined by all streams that drain into Mono Lake. The Mono-Inyo Craters forms a prominent 25-km-long volcanic complex from the NW corner of Long Valley caldera to the southern edge of Mono Lake. The late Quaternary Hartley Springs fault occurs along the Sierran range front between June Lake and the northern border of Long Valley Caldera. Recently it has been proposed that the manifestation of the volcanic and of the tectonic activity in this area is likely interrelated. According to Bursik et al (2003), stratigraphic data suggest that during the North Mono-Inyo eruption sequence of ~1350 A.D., a series of strong earthquakes occurred across the end of the North Mono explosive phase and the beginning of the Inyo explosive phase. Moreover, geological and geomorphic features of the Hartley Springs fault are consistent with rupture of the fault during the eruption sequence.

We use the Finite Element Method (FEM) to simulate a three-dimensional model and investigate the feedback mechanism between dike intrusion and slip along the Hartley Springs fault. We first validate our numerical model against the Okada (1985) analytical solution for a homogeneous and elastic flat half-space. Subsequently, we evaluate the distribution of local stress changes to study the influence of the Inyo Dike intrusion in ~1350 A.D. on Hartley Springs fault, and how the fault slip may encourage the propagation of dikes towards the surface. To this end, we considered the standard Coulomb stress change as failure criterion. Finally, we analyze the effects of the topography and of vertical and lateral heterogeneities of the crust on the distribution of local and regional stress changes. In this presentation, we highlight the preliminary results of our analysis and discuss the possible future developments of this study.

INDEX TERMS: [8123] TECTONOPHYSICS / Dynamics: seismotectonics, [9350] GEOGRAPHIC LOCATION / North America, [8178] TECTONOPHYSICS / Tectonics and magmatism, [3225] MATHEMATICAL GEOPHYSICS / Numerical approximations and analysis.

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