On the mechanisms for earth fissuring in Las Vegas valley: a numerical analysis of pumping-induced deformation and stress

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Abstract The arid Las Vegas Valley presents a very complex relationship amongst land subsidence, earth fissuring, and Quaternary faulting. The basin fill contains highly variable stratigraphy, including a thick semi-rigid vadose zone, and nonlinear pumping patterns complicate the stress–strain regime. The Eglington fault, located in the northwest part of the valley, has been selected as a prototype for this numerical analysis. Our simulation results suggest that this particular Quaternary fault has a wide zone of influence (fault-zone) whose infill is hydromechanically similar to sand. In addition, one of the most important mechanisms that cause the stress concentration in the vicinity of the fault is the tendency of the entire fault to rotate with enhanced motion through the vadose zone. A combination of accumulated tensile and shear stress in the vadose zone portion of the fault-zone and in its vicinity, creates favourable conditions for the initiation of fissures in the lower vadose zone or at the land surface.

Key words numerical simulation; earth fissuring; Eglington fault; Las Vegas valley; ABAQUS