Dynamic Stress Concentration Around Shallow-Buried Circle Cavity Under Transient P Wave Loads in Different Conditions

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Based on the large-arc assumption, an analytical model is established and solved by using the complex variable function method to illustrate the dynamic stress concentration around a shallow-buried cavity under transient loads. The jump points in the dynamic stress concentration factor (DSCF) curve that do not in line with the overall trend is filtered out to obtain more reasonable results. The convergence speed of the Graf addition formula is examined, as well as the effects of the incidence angle, frequency, and burial depth on the DSCF around the cavity. Examples show that a larger arc radius and a higher incident frequency correspond to slower convergence of the Graf addition formula. There are differences between the DSCF distributions of high-frequency incidents (such as blasting waves) and low-frequency incidents (such as seismic waves). There are three tensile-stress zones and three compressive-stress zones approximately equally spaced around the cavity in the low-frequency case, and there are two tensile-stress zones and two compressive-stress zones in the high-frequency case. Regarding the variation of the DSCFs with respect to the cavity depth, incidence angle and position of wave peak there are significant differences between the high- and low-frequency cases.