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An empirical relationship between the water level and the resonant frequencies of the Feitsui Dam

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We derive an empirical relationship between the water level of the reservoir and the resonant frequencies of the Feitsui dam and try to apply it for early detecting the damage of this dam. This study follows a series of projects that seeking any possible approach for early detecting the damage of the dam right after a major earthquake. Water level and the new cracks generated by major earthquakes are two major factors that might change the resonant frequency of a dam. If we establish such a relationship between water level and resonant frequencies for a healthy dam, then, we can quickly detect the change of the dam material (such as cracks) right after a major earthquake by comparing it with the resonant frequencies measured by the newly recorded strong-motion data and/or ambient noise.
Results showed, at least, three resonant frequencies have been identified in this data set. In general, the resonant frequency decreases as the increasing of the water level and the decreasing rate can reach 0.012Hz/m.

Keywords: arch dam; dynamic property; resonance frequency; strong-motion data