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A study on the improvement of seismic coefficients for pseudo static analysis of gravity type quay wall via dynamic centrifuge tests

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The pseudo-static approach has been conventionally applied for the design of gravity type quay walls. In this method, the seismic coefficient (k_h), expressed in terms of acceleration due to gravity, is used to convert the real dynamic behavior to an equivalent pseudo-static inertial force for seismic analysis and design. The existing k_h is simply defined as the expected peak ground acceleration (PGA) of the ground divided by the gravitational acceleration (g), which does not sufficiently reflect the real dynamic behavior. In order to improve the k_h definition, a number of studies have been performed for reducing the differences between pseudo-static and true dynamic behavior. In this regard, questions regarding the need for considering the effect of frequency characteristics of input earthquake, natural period of the backfill soil and the subsoil underneath the wall, and wall height on the deformation of quay wall crown (D_h) have been explored. In this study, dynamic centrifuge tests were conducted using the gravity type quay wall models designed with a k_h value of 0.13 to assess the behavior of the model wall during earthquakes. Three different variables: input earthquake motions, wall heights and the thickness of subsoil underneath the wall were considered, and the test results were compared and analyzed to assess the validity of the conventional k_h concept under these conditions. In addition, some improvements that should be considered for the future revision of the k_h definition are discussed.