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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Effects of relative density and accumulated shear strain on post-liquefaction residual deformation" *by* J. Kim et al.

Anonymous Referee #3

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Journal: NHESS Title: Effects of Relative Density and Accumulated Shear Strain on Post-Liquefaction Residual Deformation Author(s): J. Kim et al. MS No.: nhess-2013-111 MS Type: Research Article

General Comments:

This is a basic research paper on residual deformations due to liquefaction using laboratory tests using hollow torsional shear specimens. The K0-condition is very much concerned to conduct the tests even for monotonic shear tests (big question).

Liquefaction-induced residual deformation was investigated and it has been established by Ishihara and others that post-liquefaction settlement in the K0-condition is uniquely correlated with the maximum shear strain during undrained seismic loading.

Presumably this paper tries to evaluate not only residual volumetric but also shear deformations under the influence of certain initial shear stresses such as sloping ground, embankment or neighboring superstructures. The goal is challenging, though the present research results seem to be insufficient to meet it, in terms of the test conditions, applicability of the lab test results to actual design, etc. Additional test program to simulate field conditions more appropriately and thorough revision of the paper are preferred before resubmitting the paper.

Specific Comments:

1. The basic questions the reviewer has is that if the residual shear deformation is main concern, the test should not be conducted under K0-test condition, because K0 condition is only for level ground to investigate 1-dimensional settlement without any initial shear stress. Monotonic shear loading to evaluate residual shear deformation should not be done under K0-condition but under anisotropic stress condition with different vertical and stresses without keeping K0 stress. It may be possible in triaxial tests and in the hollow torsional shear tests, too. 2. In addition to that, links between the lab test conditions and actual field conditions to be considered in design are not clear to conduct the test; namely, how undrained cyclic loading, monotonic loading and drainage are combined. It is difficult to imagine that a soil element is first under K0-condition for uniform level ground, then suddenly monotonic shear stress appears. The meaning of drainage and its timing is also unclear in terms of design practice 3. In Fig. 16, which seems to be the conclusive results of the paper, the number of test data seems insufficient with too crude stepwise parameters to demonstrate the reliability of the correlations between residual volumetric strain and residual shear strain along other variables incorporated in the test program, Dr, accumulated shear strain. More systematic test program with more steps of changing parameters may be needed for this paper to demonstrate reliability as a reference in considering actual engineering design.

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