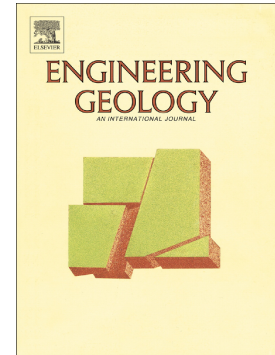


Accepted Manuscript

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PII: S0013-7952(17)31114-6
DOI: doi: [10.1016/j.enggeo.2017.08.002](https://doi.org/10.1016/j.enggeo.2017.08.002)
Reference: ENGEO 4611

To appear in: *Engineering Geology*

Received date: 1 June 2016
Revised date: 29 July 2017
Accepted date: 1 August 2017

Please cite this article as: Wei Wang, Yu Wang, Qiming Sun, Mao Zhang, Yixing Qiang, Mengmeng Liu , Spatial variation of saturated hydraulic conductivity of a loess slope in the South Jingyang Plateau, China. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Enggeo(2017), doi: [10.1016/j.enggeo.2017.08.002](https://doi.org/10.1016/j.enggeo.2017.08.002)

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Spatial variation of saturated hydraulic conductivity of a loess slope in the South Jingyang Plateau, China

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Abstract

Although water level and moisture changes in loess soils are important triggers for loess landslides, hydraulic conductivity of the loess also plays an important role. By analyzing a soil trench and soil samples from the South Jingyang Plateau, northwest China, a loess slope was investigated. A horizontal adit in a Lishi loess layer was also analyzed. Using variable head permeability tests the saturated horizontal hydraulic conductivity (K_h) and saturated vertical hydraulic conductivity (K_v) of the loess samples were measured. Results showed that the majority of the K_h values are larger than the K_v values, indicating that the loess exhibits permeability anisotropy. Lilliefors test was used to determine the normality of the K_h and K_v results. Test results indicate that K_h and K_v measurements of the loess samples collected in the trench and adit all show log-normal distribution, while a number of the K_h and K_v values also reflect a normal distribution. Geo-statistical analysis shows that the spherical model and the Gaussian model provide the best fit variograms of K_h and K_v values along the trench; analysis along the adit indicated the opposite results. The variogram range values suggest that the spatial correlation of loess K_v is greater in the vertical direction in a horizontal plane, while the spatial correlation of K_h in the adit is greater than that in the vertical direction. Loess structure rather than randomness decides the spatial variation of K_h and K_v measurements (except for K_h variation along the adit which depends on both structural factor and randomness). K_h and K_v values of loess tend to decrease with depth; results which can be described by an exponential decay model.

Keywords: Loess slope; Saturated hydraulic conductivity; Spatial variation; Probability distribution; Geo-statistical methods

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