

正断层破坏在砂土中传播规律试验模拟

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MODELING TEST OF NORMAL FAULT RUPTURE PROPAGATION IN SANDY SOIL

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摘要 断层错动不仅可以引起地震灾害,而且带来的地层永久性变形,对结构物特别是线性构造物,如地下管线,隧道等,造成很大影响,因此,研究断层破坏在上覆土层中传播规律是十分必要的。本文依据正断层砂箱模型试验,对断层在砂土中传播模式,断层在地表的露头位置,断层垂直位移与土体厚度关系等内容进行了分析,并认为:(1)砂土中正断层破裂面不唯一,出现分叉;(2)传至地表所需的断层垂直位移与倾角无关;(3)正断层传播形成三角剪切带,其宽度随断层倾角减小而增大。

关键词: 断层 传播 模型试验 破坏

Abstract: Fault movement cannot only cause earthquake, but also bring about permanent deformation in strata. They have great damage to structures, especially linear structures like underground pipelines and tunnels unavoidably. The Kobe earthquake in Japan in 1995 and the Taiwan Chi-Chi earthquake in 1999, the WenChuan earthquake in China in 2008 have all caused to large losses of lives and properties. Active faults are widely distributed in China. Therefore, study on earthquake fault rupture propagation in overlying strata is essential. Many scholars at home and abroad have paid attentions to this subject. Modeling test, centrifuge test and numerical method are used to research the problem. Generally the damages induced by surface rupture are considered as a result of discontinuous deformations of overlying soil resulting in vertical or lateral offset at the surface of soil. However, due to the reason of the complexity of geological and stratigraphic conditions, the limitation of research and field monitoring methods, the question still does not have a clear answer.

On the base of sand box, the paper aims to reveal the patterns of fault rupture propagation and location of surface rupture in sandy soil under 1-g modeling test of normal fault. It also studies the relationship between vertical displacement and height of overlying strata. that the following results are found. The failure surfaces of normal fault begin to propagate directly up to the surface regardless to dip angle. Then the following failure surfaces appear. The required vertical displacement when a complete failure surface forms is independent with the dip angle. In the modeling test, the value of D/H comes out to be 4.4%. As many failure planes exist when fault rupture propagates, an apparent triangle shear zone stays between them. At the surface, the width of the triangle shear zone reaches a maximum S . The value of S becomes greater as the dip angle decreases.

Key words: Fault Propagation Modeling test Rupture

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