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枕、球—枕构造: 地层中的古地震记录 [点此下载全文](#)

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摘要:

枕状构造(pillow)与球—枕构造(ball and pillow)、负载构造(load)是地层中的软沉积物变形构造, 它们在形态、产状、变形机制等方面是不同的。枕状构造是砂层中一组呈“凹”形弯曲的变形沉积体, 它的原始层平行于枕状体的底面, 顶面则是一个平直的截切面。枕状构造是由于层状砂层强烈液化向上覆软沉积砂层流动、穿刺, 使之弯曲褶皱, 在原地固定位置形成, 因此枕状构造在一个层内是沿岩层走向呈现一系列相间隔的向形和很窄的背形。形成球—枕构造与负载构造的软沉积层包括细砂单元与上覆粗砂单元。他们的变形机制与砂层的液化作用有关。下伏细粒砂单元具强的液化变形而上覆粗砂单元为弱变形层。上覆粗砂单元(比重大)在下伏细砂单元(比重小)之上形成一个不稳定重力驱动系统, 地震发生时的剪切力使重的粗砂(弱液化)陷落下沉至下伏细粒单元(强液化)中成负载构造和球—枕构造。球—枕体位于细砂层的不同位置, 表明他们是下沉穿越细砂单元为异地沉积体。形成枕、球—枕及负载体的软沉积物液化变形机制不同, 但液化作用的触发机制是强地震。这些液化变形构造在实验室砂层的振动液化模拟实验中也已得到证实。地层中的枕状构造及球—枕、负载构造代表一次 $M_s > 5$ 的古地震灾变事件。古地震往往是沿着某些古地震断裂分布, 是古地震断裂活动的表现。本文将举例讨论我国古老地层中的某些枕状构造、球—枕与负载构造, 并简述当时发震的构造背景。

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Abstract:

Pillow structure and ball and pillow structure are the soft sediment deformation within strata. They are different in morphological feature, mode of occurrence and mechanism of deformation. Pillow structure consists of a suit of deformed concave upward bodies made of silt and sand whose original layering bent round parallel the basal surface and it truncated at the top surface. The formation of pillows was initiated by the liquefaction of some definite layers within package of layered sand that was forced to fold as a result of upward flow of the liquefied sand at more or less regularly spaced sites. For these reason, the pillows occur intervals across single layered sand beds to forming a series of laterally connected synform (width) and antiforms(narrows). Soft sediment layer of load, ball and pillow involves the fine sand unit and the overlying coarse sand unit. The mechanism of deformation is related to liquefaction and fluidization processes. The fine sand unit displays active liquefied deformation features while the overlying sands show mainly passive deformation feature (hydraulic deformation). The superposition of coarse grained sand (heavy) on fine grained sand (light) represents a driving force system related to gravitational instability. The heavy sand may sink into the light sands forming load cast, ball and pillow and they retained primary lamination of the overlying coarse sand unit. The ball and pillow are located different position in the fine sand indicating that they dropped through the fine sand unit. Liquefaction and fluidization was triggered by a strong paleo seismic event. Pillow and load, ball and pillow structure are similar to those obtained experimentally at liquefied sand subjected to shaking. Deformation of pillow, ball and pillow, load structures represent a paleo seismic records of  $M_s > 5$  within strata originating along some paleo seismic fault. Some ancient examples of China are discussed in this paper.

Keywords: [pillow structure](#) [load](#) [ball and pillow structure](#), [paleoseismic record](#)

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