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龙门山前陆盆地底部不整合面: 被动大陆边缘到前陆盆地的转换

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摘要：

晚三叠世龙门山前陆盆地是在扬子板块西缘被动大陆边缘的基础上由印支造山运动而形成的,盆地中地层充填厚度巨大,包括晚三叠世卡尼期至瑞提期的马鞍塘组、小塘子组和须家河组,持续时间达20Myr,显示为1个以不整合面为界的构造层序。位于晚三叠世龙门山前陆盆地构造层序与下伏古生代-中三叠世被动大陆边缘构造层序之间的不整合面属于龙门山前陆盆地的底部不整合面,标志了扬子板块西缘从被动大陆边缘盆地到前陆盆地的转换。该底部不整合面位于晚三叠世马鞍塘组与中三叠世雷口坡组之间,显示为平行不整合面或角度不整合面,在接触面上发育冲蚀坑、古喀斯特溶沟、溶洞、溶岩角砾、古风化壳的褐铁矿、黏土层及石英、燧石细砾岩等底砾岩。该不整合面向南东方向不断地切削下伏地层,且均发育岩溶风化面,上覆的晚三叠世地层沿不整合面向南东超覆,显示了从整合面到不整合面的变化过程,并随着逆冲楔的推进向南东方向迁移,其超覆线、侵蚀带和相带的走向线与龙门山冲断带的走向大致平行。底部不整合面显示为典型的前陆挠曲不整合面,标志着龙门山前陆盆地的形成和扬子板块西缘挠曲下降和淹没过程,底部为古喀斯特作用面,下部为碳酸盐缓坡和海绵礁建造,上部为进积过程中形成的三角洲沉积物,具有向上变粗的垂向结构,表明底部不整合面和前缘隆起的抬升是扬子板块西缘构造负载的挠曲变形的产物,显示了在卡尼期松潘-甘孜残留洋盆的迅速闭合和逆冲构造负载向扬子板块的推进过程。本次在对晚三叠世龙门山前陆盆地底部不整合面的风化壳、残留厚度、地层缺失、剥蚀厚度、地层超覆等研究的基础上,计算了底部不整合面迁移速率、前缘隆起迁移速率、地层上超速率和前缘隆起的剥蚀速率,并与逆冲楔推进速率进行了对比,结果表明,底部不整合面迁移速率、前缘隆起的迁移速率、地层上超速率均介于3~18mm·a^{-1}之间,其与逆冲楔推进速率(5~15mm·a^{-1})相似,因此,可用底部不整合面迁移速率、前缘隆起的迁移速率和地层上超速率代表逆冲楔推进速率。但是前缘隆起的剥蚀速率很小,介于0.02~0.08mm·a^{-1}之间,仅为逆冲楔推进速率的1/100。

英文摘要:

The Late Triassic Longmenshan foreland basin developed as a flexural foredeep on the Yangtze passive continental margin during Indosinian orogeny, spanning the time period ca. 230~210Myr. The basin fill overlying a basal unconformity is a tectonic sequence bounded by unconformities, including Maantang Formation, Xiaotangzi Formation and Xujiahe Formation, and can be divided into four sequences (tectonostratigraphic units) by unconformities and flooding surface. The cross-sectional geometry of the foreland basin fill is typified by the wedge-shaped body, but it can be divided into wedge-shaped sequence and tabular shaped sequence. The unconformity between overlying Tectonic sequence of the Late Triassic Longmenshan foreland basin and underlying tectonic sequence of Paleozoic-Middle Triassic passive continental margin belongs to the basal unconformity of the Longmenshan foreland basin and is a typical flexural forebulge unconformity which marks the transition from the passive continental margin to the foreland basin in the western Yangtze plate. Accurately the basal unconformity locating between the Upper Triassic Maantang Formation and the Middle Triassic Leikoupo Formation belongs to the parallel or angular unconformity. On the surface of the basal unconformity, there are erosion pits, paleo-karst (including solution groove, cave and breccias), crust of paleo-weathering (including limonite, clay and quartz), and basal conglomerate (such as fine chert conglomerate). And, directing to the southeast, the basal unconformity continually truncated underlying strata, rifely developing as karst weathering surface. The overlying Late Triassic strata overlap to the southeast along the unconformity; the striking of overlapping lines, erosion belt and sedimentary faces are roughly parallel to the striking of the Longmenshan thrust belt, which shows the transiting from conformity to unconformity and the southeastward migrating with the advance of the thrust wedge from NW to SE. The basal unconformity shows establishment of the Longmenshan foreland basin and drowning of a distal margin of the Yangtze plate by carbonate ramp and sponge build-up, deepening into offshore marine mu ds, followed by progradation of marginal marine siliciclastics. The formation of the basal unconformity and uplift of the forebulge is driven by the flexural deflection of tectonic loads in the margin of the Yangtze plate. The orogenic load system initially advanced towards the Yangtze plate in the Carnian, associated with the rapid closure of the Songpan-Ganzi Ocean. Based on the weathering crust, the residual thickness, the missing strata, the erosion thickness, stratigraphic overlap in the Late Triassic on the basal unconformity, the migration rate of the basal unconformity, migration rate of forebulge, stratigrapic onlap rate, and erosion rate of forebulge have been calculated here, the results showed that the migration rate of the basal unconformity, migration rate of forebulge and stratigrapic onlap rate are all between 3mm • a^{-1} and 18mm • a^{-1}, winch are similar to the thrust wedge advancing rate (5~15mm • a^{-1}). Therefore, the thrust wedge advancing rate can be instead of the migration rate of the basal unconformity, migration rate of forebulge and stratigrapic onlap rate. However, erosion rate of forebulge is only 1/100 of thrust wedge advancing rate (0.02~0.08mm • a^{-1}).

关键词： 前陆盆地 底部不整合面 前缘隆起 地层上超 构造负载 挠曲变形 晚三叠世 扬子板块西缘 龙门山

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