

报告题目： 龙游石窟千年完整的机理研究
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摘要： 龙游石窟位于浙江省龙游县，是 1992 年抽水后发现的，开挖于 2000 年前的古洞室。其保持了上千年稳定的这一事实向现代工程地质学、岩石力学中的自稳时间和长期强度等提出了挑战 and 质疑。这些洞室均具有浅埋、大跨度特点；具有斜顶加岩柱结构；洞室边墙均稍向洞内倾斜；洞内岩柱的横截面呈有趣的“熨斗”状（鱼尾形岩柱），且岩柱顶端有斜托；洞内凿痕精美壮观。其中一些洞室仍然保持完整，有的却已产生了各种破坏现象。洞室的破坏方式主要以洞口坍塌破坏、侧壁块体塌落、洞室顶板脱落以及岩柱破坏等为主。而完整的洞室自 1992 年抽水开发后也出现了裂缝，且裂缝不断扩展。通过对洞室稳定性计算结果发现，龙游大型古地下洞室群采取的特殊结构对洞室的整体稳定极其有利，即其洞室群的结构设计具有一定的科学性，是洞室群得以保持千年以上完整的内因。而洞室充满水，一方面可以有效地改变洞室围岩的受力，另一方面可以减小顶板的下沉量，对洞室的稳定也极为有利。且通过洞内凿痕的测量对比研究发现，洞内充满水可以减缓洞室围岩的风化速度。因此，洞内充水是使龙游大型古地下洞室群保持上千年完整的外因。

Design, Construction and Mechanical Behavior of Relics of Complete Large Longyou Rock Caverns Carved in Argillaceous Siltstone Ground

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Abstract: Longyou rock caverns were carved about 2 000 years ago at shallow depths in argillaceous siltstone. The fact that the caverns keep being integrity for more than 1000 years is invaluable both to the long-term protection and preservation of the large rock cavern relics of national and international interests and importance, and to extend enrich our experience and knowledge on the long-term stability and integrity of man-made underground rock cavern engineering projects. The caverns have typical features including large spans, portals, extreme shallow-buried depths, imprints, drainages, inclined ceilings, inclined sidewalls, slender rock pillars, rock staircases. These special structures are the one main factor for the integral of Longyou Caverns. Moreover, the full occupation of water with weak acidity in the large rock caverns with the soft surrounding rocks of weak alkalinity is found to be the other main factor ensuring and preserving the caverns to have been stable and integral over 2 000 years. However, the five unwatered complete rock cavern relics have been experiencing various deteriorations and small failures including cracks, seepage, small rock falls and delaminating ceiling rocks. Although these deteriorations have been repaired and stabilized effectively, an entire roof collapse failure is highly possible in the near future to each of the five unwatered rock cavern relics.