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Weathering rate of ancient limestone inscription in Beixiangtang Temple Grottoes, China

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Weathering rate of rocks is an important index for appraising stability and protecting stone cultural relics. Beixiangtang Temple Grottoes are of art treasury with the largest and most intact rock inscription of Beiqi dynasty (A.D. 550~577) in China. The Grottoes are located in south of Gu Mountain 45km away from Handan city in Hebei province, China (Fig.1). The Beixiangtang Temple Grottoes are composed of seven grottoes. There are two inscriptions, 1 and 2, carved in two rock walls outside and inside grotto No.7, respectively. The two walls belong to the same limestone and are close to each other. According to the record of lection in grotto No.7, inscriptions 1 and 2 were carved by the same person in May of A.D.572. The style and dimension (3 cm×3 cm) of the inscriptions are almost identical. Under the long-term weathering, the readability of them is bad. But the weathering degree of them is different due to different environment and rock mass structures. In other words, the weathering rate of the limestone inscription is different. Based on the field investigations, the rock mass structures are the main factor which influence the weathering rate of the limestone.



Figure 1: Location of Beixiangtang Temple Grottoes

In this paper, the weathering rate of the limestone inscription were measured and calculated. It's the first time to quantitatively analyze the weathering rate of rock considering the development of rock mass structures.

As a result, an average weathering rate (the lower limit) of 0.01899 mm/100 a, was obtained for limestone under the local environmental conditions. Furthermore, it was found that discontinuities in rock masses greatly accelerate the weathering; as an example, a value of over 0.06578 mm/100 a was obtained.

References:

- [1] Alice V Turkington, T R P (2005) *Geomorphology* 67, 229-253.
- [2] Camuffo D (1992). *Urban Atmosphere* 26(2), 241-247.
- [3] Livingston R A, and Baer, N S (1990) *Environmental Geology* 16(1), 83-90.

- [4] Meierding T C (1993a) *Geomorphology* 6(3), 273-286.
- [5] Meierding T C(1993b) *Annals of the Association of American Geographers* 83(4), 568-588.
- [6] O'Brien P F et al. (1995) *Science of The Total Environment* 167(1-3), 111-121.
- [7] Pope G A et al. (2002) *Geomorphology* 47(2-4), 211-225.
- [8] Roberts, S. M. (2005). *Geological Society of America Special* 390, 27-37.
- [9] Sancho C et al. (2003) *Catena* 53(1), 53–64.
- [10] Tony Wells G H (2008) *Environmental Geology* 54(5), 1047-1057.

