

Terrestrial laser scanning approach on quantification of weathering depth of sandstone blocks in a coastal environment

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Weathering in a coastal environment often causes degradation of artificial constructions if they are composed of weathering-prone materials including natural rocks and cements. Conservations of the vulnerability of such construction materials to weathering processes are thus important for their maintenance. Point to point, or cross-sectional measurements using scale bars have often been effective in describing the degree of weathering of such materials. However, accurate measurements of the amount of weathering in terms of areas and volumes have not often been performed due to the limitation in the measurement method for detailed, three-dimensional surface morphology. Here we demonstrate terrestrial laser scanning to describe three-dimensional surficial morphology of a weathered material: sandstone blocks used for masonry piers of bridge on a shore platform at Aoshima, Miyazaki in western Japan. The blocks have suffered from salt weathering above the sea level since the construction of the bridge in 1951. Weathering-induced depressions of sandstone blocks well develop in the spray zone. Our approach revealed sub-centimeter scale morphology of the block surfaces, as well as weathering depths and volumes of each block. Spatial distribution of the amount of weathering was also examined with regard to the sea level and the rock surface hardness. Continuous measurement of such detailed morphology will be necessary to clarify the contemporary rates of weathering therein.

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