

## Laboratory experiment of scale effect for frost shattering

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This study investigated the size effects for frost shattering on A) welded tuff B) limestone C) tuff D) tuffaceous sandstone and E) sandstone. These samples are made into 1cm, 2cm, 3cm, 4cm and 5cm cubes. Freeze-thaw experiment were performed under the repeated temperate condition between repeated +15°C and to -15°C. This individual cycle continues 6 hours and up to 400 cycles. Exfoliation patterns are summarized that 1) small samples divided into two pieces with nearly equal sizes, 2) the amount of debris increases with decreasing the specimen sizes, and 3) small samples were rocks having bulk density and high porosity tend to be more damaged by frost shattering.

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