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Response of quartz sandstones to the artificial weathering experiments

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Five types of quartz sandstones showing variable physical properties (compressive strength 34-96 MPa, water uptake 2.7-8.7 wt. %, open porosity 6.1-16.9 vol. %) were subjected to (1) 6, 12, 24, 48, 72, 96, 120 and 144 cycles of freezing/thawing, (2) 5, 10, 15, 20 and 25 cycles of salt crystallization, and (3) combination of both. After certain number of cycles, part of specimens was taken away from the climatic chamber and tested for physical properties (bulk density, bulk porosity, compressive strength, water uptake). The pore space evolution was quantified by mercury intrusion porosimetry. The macroscopically visible modification of the specimens (e.g. alteration of surface by granular disintegration or flaking/scaling) was also documented and quantified by image analysis of digital photographs). Each of the tested parameters shows distinct evolution that can be described by different model. Our study thus confirms that evaluation of the dynamics of weathering highly depends on the measured property.