

The weathering of granitic rocks in the Sør-Rondane Mountains, East Antarctica

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Weathering processes in hyper-arid and hypothermal environments are key to our understanding of geomorphological processes and landscape evolution in Antarctica. Here, we explore the weathering of granitic rocks and the associated weathering products in the Sør-Rondane Mountains of East Antarctica, to obtain quantitative information regarding the physical and chemical weathering of granitic rocks in hyper-arid and hypothermal environments. Various petrological techniques, including whole-rock chemistry, loss on ignition measurement, mineral chemistry, laser-Raman microspectroscopy, in addition to color measurement and hardness test for the rock samples, were used to analyze the physical and chemical weathering of the rocks. These measurements reveal that the weathering of granitic rocks in the Sør-Rondane Mountains of East Antarctica is controlled mainly by oxidation, including iron hydroxide formation in veins formed by the thermal expansion and contraction of rock-forming minerals, frost shattering and/or salt fretting, and Fe-Ti oxide alteration in the rock interior. Importantly, these physical and chemical weathering processes are unlikely to require a liquid water supply from the environment, and the restricted supply of liquid water and salt is the most probable explanation for the extremely slow weathering rates in the Sør-Rondane Mountains.

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