# Subarctic Weathering and Carbonation of Serpentinized Dunites

J. HÖVELMANN[1]*,[2], H. AUSTRHEIM[2], A. BEINLICH[2,3], O.I. ULVEN[2] AND B. JAMTVEIT[2]

[1]Institut für Mineralogie, University of Münster, 48149 Münster, Germany (*correspondence: j.hoevelmann@wwu.de)

[2]Physics of Geological Processes (PGP), University of Oslo, 0316 Oslo, Norway

[3]Mineral Deposit Research Unit (MDRU), Department of Earth, Ocean and Atmospheric Sciences, The University of British Columbia, Vancouver, BC V6T 1Z4, Canada

Weathering of ultramafic rocks has important consequences for element cycling, soil formation, and carbon uptake. Carbonate formation during breakdown of ultramafic minerals (e.g., olivine, pyroxene, serpentine, brucite) contributes significantly to the consumption of atmospheric $CO_2$. However, ultramafic rock weathering also involves the release of asbestos and fluid mobile toxic Ni- and Cr-bearing compounds into agricultural land and drinking water. Element uptake and release during weathering is controlled by the different dissolution rates of the minerals involved, which in turn depend on the prevalent climatic conditions. The weathering of ultramafic rocks is mostly studied in tropical and temperate climate zones, where it usually results in the formation of deep laterites depleted in Ca, Mg and Si and enriched in Fe, Co, Cr, and Ni [1, 2]. However, besides recent investigations of the natural carbon uptake potential of ultramafic mine wastes in Canada [3], little is known about ultramafic rock weathering in the arctic and subarctic climate zones. Here we present new insight into chemical, physical and mineralogical processes taking place during saprolite formation at subarctic climatic conditions at the Feragen Ultramafic Body (FUB) in E-Norway [4]. The Weichselian glaciation constrains the age of the formed saprolite to less than 10 ka and its small thickness yields constraints on element mobility, vein growth, carbonation and mechanical fragmentation at the atmosphere-rock interface. The presence of abundant extracellular polymeric substances (EPS) and bacteria on surfaces of ultramafic rock debris further suggests that weathering reactions may have been enhanced by microbial activity.

[1] Oze *et al* (2007) *PNAS* **104**, 6544-6549. [2] Schwertmann & Latham (1986) *Geoderma* **39**, 105-123. [3] Wilson *et al* (2011) *Envrion. Sci. Technol.* **45**, 7727-7736. [4] Beinlich & Austrheim (2012) *Chem. Geol.* **332**, 32-44.