



## **Characterization of olivine fabrics and mylonite in the presence of fluid and implications for seismic anisotropy and shear localization**

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The Lindås Nappe, Bergen Arc, is located in western Norway and displays two high-grade metamorphic structures. A Precambrian granulite facies foliation is transected by Caledonian fluid-induced eclogite-facies shear zones and pseudotachylytes. To understand how a superimposed tectonic event may influence olivine fabric and change seismic anisotropy, two lenses of spinel lherzolite were studied by SEM and EBSD techniques. The granulite foliation of the surrounding anorthosite complex is displayed in ultramafic lenses as a modal variation in olivine, pyroxenes and spinel, and the Caledonian eclogite-facies structure in the surrounding anorthosite gabbro is represented by thin (<1 cm) garnet-bearing ultramylonite zones. The olivine fabrics in the spinel bearing assemblage were E-type and B-type and a combination of A- and B-type LPOs. There was a change in olivine fabric from a combination of A- and B-type LPOs in the spinel bearing assemblage to B- and E-type LPOs in the garnet lherzolite mylonite zones. FTIR analyses reveal that the water content of olivine in mylonite is much higher (~600 ppm H/Si) than that in spinel lherzolite (~350 ppm H/Si), indicating that water caused the difference in olivine fabric. Fabric strength of olivine gets weaker as the grain size reduced, and as a result calculated seismic properties for the two deformation stages reveal that P- and S-velocity anisotropies are significantly weaker in the mylonite. Microtextures and LPO data indicate that the deformation mechanism changed from dominant dislocation creep in spinel lherzolite to dislocation creep accompanied by grain-boundary sliding in mylonite. Shear localization in the mylonite appears to be originated from the grain size reduction through (1) enhanced dynamic recrystallization of olivine in the presence of water and (2) Zener pinning of clinopyroxene, or (3) by ultracommunitation during the pseudotachylyte stage.