Very high anisotropies of the magnetic susceptibility in ductile shear zones: first quantitative results from a metamorphic nappe in the Central Scandinavian Caledonides, Sweden *Poster*

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Shear zones in the Seve crystalline basement nappes of the central Scandinavian Caledonides contributed to exhumation and translation of these high-grade metamorphic rocks. The Seve unit is considered to represent the former distal passive margin of the continent Baltica, which was subducted beneath an island arc during Ordovician times and subsequently collided with the continent Laurentia during Silurian and early Devonian times. Strongly textured mylonitic garnet mica schists with well developed mica fish and S–C-fabrics from a shear zone within the Seve unit show unusual high anisotropies of the magnetic susceptibility (AMS). The corrected degrees of anisotropy of the magnetic susceptibility (P') range from 1.78 to 4.24. Bulk susceptibilities range from 2.8×10^{-3} to 96.9×10^{-3}. The shape factors range from 0.32 to 0.62, documenting an oblate shape. Magnetic foliation is subparallel with metamorphic foliation. Magnetic lineation scatters due to permutations of the maximum and intermediate principal susceptibility axes. Temperature-dependent susceptibility measurements identify magnetite as the carrier of the bulk susceptibility. The temperature dependent susceptibility curves indicate a minor contribution of iron carbonates. Such high anisotropies from natural samples have not yet been documented elsewhere. These high anisotropies result from apparently flattened magnetite. The relatively incompetent mylonite is 'sandwiched' between competent mafic-ultramafic rocks and localizes deformation. A multidisciplinary quantitative approach involving rock magnetic studies, geochemical data, digital image analysis, and X-ray texture goniometry (XTG) is carried out.

A section across this ductile shear zone was sampled systematically from top to bottom over a vertical distance of ca. 0.8 m (six samples). The bulk susceptibility and the degree of AMS increase from top to bottom. With the exception of one sample this coincides with increasing total Fe-content. Other samples from exposures of similar lithologies also exhibited high anisotropies ($2.59 < P' > 4.15$). Magnetite grains occur as inclusions in mica and garnet as well as in the fine-grained quartz-mica matrix. Grain sizes range from a few µm to ca. 0.5 mm. First digital image analysis of SEM-pictures (x–z-sections) of a high-AMS sample shows ca. 2% modal magnetite with a mean ellipticity of 3.3 and with ellipticities of up to 16.7. Statistically, the long axis of the magnetite grains is oriented subparallel with the S-planes. The magnetite grains can be thus used as kinematic indicators. The bulk susceptibility k and the anisotropy P' show a clear positive log-rhythmic correlation. The log-rhythmic relationship can be expressed by the general equation $P' = a \cdot \log k + b$. The geological meaning of the parameters a and b is not yet clear. These parameters could be a quantitative expression for: 1) the modal magnetite content, 2) the

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distribution density of magnetite, and 3) the degree of deformation of magnetite grains and the associated shape.