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Anisotropy of magnetic susceptibility measurements (AMS) and microfabric analyses from the late Variscan North Schwarzwald Granite complex, SW Germany – first results

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The North Schwarzwald Granite complex (NSGC) comprises Late Variscan (∼325 Ma) S-type granites, which are reasonably well exposed over an area of >600 km2 in the northern Schwarzwald in SW-Germany. The granites intruded migmatitic sillimanite-biotite gneisses and are unconformably covered by younger sedimentary rocks. The NSGC marks a phase of late Variscan partial melting of crustal material postdating high-grade eclogite- and granulite-facies metamorphism. The NSGC comprises biotite, muscovite and two-mica granites as major granite types, which can be further subdivided based on grain size and content of porphyric K-feldspars (‘megacrysts´).
367 samples from 34 sample locations have been analyzed so far for this ongoing study. Mean susceptibilities vary from 28 to 394x10-6 SI. 94% of the samples display low anisotropies (P´ < 1.1). Higher anisotropies (P´ > 1.1) were obtained from locations close to major NNE-striking Variscan shear zones implying syn-intrusive fault activity. 80% of the samples outline oblate AMS ellipsoids. Magnetic foliations show highly variable orientations and dip angles. The carriers of the susceptibility are mainly paramagnetic micas, which is in agreement with the dominantly oblate AMS-ellipsoids and the relatively low susceptibilities. Samples from the NSGC boundaries show ductile deformed quartz at the thin section scale displaying subgrain formation and rotation and the location of micro shear zones. The presence of ductile deformed quartz indicates significant sub-solidus deformation, but anisotropies remain low (P´< 1.1). P´ alone is thus not a suitable parameter to distinguish between dominantly hyper-solidus or sub-solidus fabrics and thus microfabric analyses are always required. Meso-scale mylonitic shear zones with variable orientations and shear senses are also present within the granites at the outcrop-scale, which may be related to emplacement processes. The AMS-data outline variable orientations of magnetic foliation and lineation, which – together with field observations and micro-fabric analyses – tentatively indicates multiple more or less, interpenetrated cupolas (or polydiapirs) of similar composition and affected by localized large scale Variscan ductile shear zones.