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# Documenting Mica Microstructures in Mylonites of the Cossato-Mergozzo-Brissago Line, Northern Italy

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The rheology of the Earth's crust is ultimately a function of the properties of its constituent minerals. Nowhere are the results of applied tectonic stresses within the Earth's crust more evident than along large scale fault zones and shear zones where strains become focussed producing localised deformation and displacement. These dynamic tectonic discontinuities are often dominated by fault rocks and mylonites that contain an abundance of phyllosilicates (such as micas) whose inherent weakness, relative to other silicate phases (Mariani et al. 2006), acts to concentrate deformation along these narrow regions. Experimental studies show that even in rocks where the concentration of weak phases, such as micas, is low, their effect on the strength and fabric of the rock is significant due to processes such as strain-induced interconnectivity (Holyoke & Tullis 2006). Once this interconnectivity has been established, very high strains can be accommodated within very narrow regions, termed shear bands or micro-shear zones. In this study, a combination of optical and scanning electron microscope (SEM) based techniques including electron backscatter diffraction (EBSD) have been used to observe and document features that are indicative of such processes within samples collected from the Cossato-Mergozzo-Brissago (CMB) shear zone in North Western Italy. This tectonic discontinuity is interpreted to be of Permian age and separates the metapelitic schists of the Kinzigite formation of the lower crustal Ivrea-Verbano zone from the mid-crustal schists and amphibolites of the Serie dei Laghi. Despite its present vertical attitude, the CMB line is believed to have formed as a gently inclined, mid-crustal shear zone during the early stages of post-Hercynian crustal stretching (Rutter et al. 2007). This has produced mylonites composed predominantly of quartz, feldspar and abundant phyllosilicates which serve as perfect natural examples on which to study the distribution of micas, their internal structure and the microstructures of other neighbouring phases in order to give insights into the mechanisms of deformation active within micas under conditions of large, predominantly simple shear strain. Future work will include detailed geological mapping of transects across the CMB line as well as the use of quantitative methods including EBSD to identify crystallographic preferred orientations of grains of mica, and other phases with higher strength, in order to better understand the deformation mechanisms of micas and the role they play in strain localisation and deformation within the crust.

References

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