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The rheology and mechanical anisotropy of a foliated blueschist

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Blueschists are a major constituent rock type along the subduction zone interface and therefore critical to our understanding of subduction zone dynamics. Previous experimental work on natural blueschists focus on either seismic anisotropy or on the process of eclogization of a blueschist aggregate. We have begun an experimental investigation to constrain the rheology and mechanical anisotropy of a naturally foliated blueschist from the Condrey Mountain Window, CA, USA. General shear experiments were performed in a Griggs apparatus using cores of the natural blueschist at 700°C, 1 GPa, and a shear strain rate of ~10^{-5} s^{-1}. The starting material consists of ~55% glaucophane, ~40% epidote, ~5% titanite, and <5% quartz where both glaucophane and epidote have strong crystallographic fabrics and shape-preferred orientations that define the foliation. Three types of experiments were performed: 1) with the foliation parallel to the shear plane, 2) with the foliation parallel to the sigma1 direction, and 3) where the starting material was crushed into a powder representing no foliation. Both of the foliated experiments achieve similar peak shear stresses of ~250 MPa; however, the sample with the foliation parallel to the shear plane shows strain weakening while the sample with the foliation parallel to the sigma1 direction shows no strain weakening. We also observe several stress drops of ~20-30 MPa in the sample with the foliation parallel to the sigma1 direction prior to peak stress conditions. Microstructures from both of the foliated samples show evidence for brittle deformation processes, while kinking is also commonly observed in glaucophane. The sample with no foliation has a lower shear stress of ~130 MPa and shows no evidence for brittle deformation processes but rather shows development of a S-C-C' mylonitic fabric. Additional experiments will be performed at different temperatures and strain rate conditions. A detailed microstructural analysis will accompany the mechanical results.