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Exploring the link between anisotropy of magnetic susceptibility (AMS) and deformation fabric in the Chester gneiss dome, southeast Vermont

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Anisotropy of magnetic susceptibility (AMS) is the directional dependence of magnetic susceptibility, and can be caused by a number of factors. Important contributors to AMS include shape anisotropy of individual magnetic grains, as well as crystallographic preferred orientation (CPO) of magnetic and/or non-magnetic (e.g. silicate) minerals. Both of these factors can result from deformation. In the case of elongated magnetic minerals with high shape anisotropy, the maximum susceptibility is parallel to the long axes of the grains, which are typically preferentially oriented parallel to the stretching direction, or flow direction. Single crystals of non-magnetic Fe-bearing minerals, such as amphibole, have AMS that is related to the crystalline structure of those minerals. Rocks containing significant amounts of these minerals will have a contribution to the bulk AMS that is derived from silicate mineral CPO. If the silicate contribution is strong enough, the bulk AMS ellipsoid may provide information related to the silicate deformation fabric. Silicate mineral CPOs are typically the dominant control on elastic anisotropy in rocks from the middle and lower continental crust, so if AMS measurements can be used to infer deformation fabric, they would also provide an easy way to model elastic anisotropy. Here we focus on AMS properties of rocks from the Chester gneiss dome in southeast Vermont. We will report bulk AMS measurements of 65 samples and characterize how the AMS properties are related to rock fabric and modal mineralogy. We will also use EBSD to characterize the silicate mineral CPOs for a subset of the samples. The CPO data will be used to model the silicate contribution to the AMS, and investigate relationships between bulk AMS and silicate CPO. Additionally, the CPO data will be used to calculate aggregate elastic tensors, and compare elastic anisotropy with AMS. Preliminary results suggest that bulk AMS is consistently oriented with respect to the macroscopic rock fabric, in particular for samples rich in micas and/or amphibole. In all of the initial samples for which EBSD characterization has been completed, Kmin is parallel to the minimum Vp, and both are perpendicular to the foliation. Kmax is most often parallel to the maximum Vp, but this correlation is not as consistent as that for Kmin and minimum Vp. We will discuss the factors that might determine when AMS is, or is not, a good proxy for elasticity.