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Comparing Crustal and Mantle Fabric from the North American Craton Using Magnetics and Seismic Anisotropy

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A central target in Earth sciences is the study of deformation at various depth levels within the Earth. Seismology has offered a remarkable tool for doing this via seismic anisotropy. It is however not always clear how to interpret those observations. A question of interest is to understand the relation between the deformation of the mantle and the crust, and in studying the relation between the two. Mantle deformation is expressed in seismic anisotropy. In this paper we seek an objective way of extracting information about crustal fabric as well, to be able to compare with seismic anisotropy. The magnetization of crustal rocks offers an attractive possibility for doing this. We thus explore the use of magnetic data, and we compare magnetic crustal fabric orientation with mantle fabric observations from seismic anisotropy. We apply our technique to the North American craton for which we have an excellent magnetic dataset, and we show that there is a clear relation between crustal and mantle fabric for the cratonic region. This has important implications for crustal formation, and for interpreting seismic anisotropy observations.