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A comparison of Anisotropy of Magnetic Susceptibility Studies to Clast Based Strain Analysis in Sandstones, From The Outer Margin Of The Sevier Orogenic Foreland, Western Wyoming.

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The Cordilleran Mountain Belt of North America is one of the world's classic foreland fold and thrust belts. The Sevier Belt represents the thin skinned front of this orogeny, consisting of thrust faults and folds that shortened and transported sequences of Devonian to Cretaceous strata eastward. There is a general increase in deformation westwards which provides an ideal geological setting to explore the potential link between Anisotropy of Magnetic Susceptibility (AMS) and results from clast based strain analyses of sandstones. Studies attempting to define the relationship between AMS and finite strain have been in vogue since the link between layer parallel shortening and AMS was first established. The understanding of this relationship, despite proven strong correlations between the AMS tensors and tectonic directions, is complicated by competing sub-fabrics, as well as the various magnetic properties of the minerals contributing to the AMS fabric.

It has become very clear that the sensitivity of AMS is capable of detecting incipient tectonic fabrics, <5% shortening, which is typically outside the range of most dedicated strain analyses. Despite this, there has been little published research into the relationship between the classic fabric analysis techniques or strain estimate methods and AMS. This may be due to the particularly laborious task of calculating strain estimates using large marker populations and/or the pitfalls of trying to relate the magnitudes of the magnetic ellipse to the magnitudes of the strain ellipse.

Rather than trying to estimate finite strain directly from the AMS ellipsoid, we are using the ability of AMS to accurately and quickly qualify the petrofabric and determine the origin of that fabric (i.e. whether it is purely sedimentary, composite bedding/tectonic or dominantly tectonic etc.). Where as most methods of estimating strain have poor accuracy constraints in low strain regimes. In an attempt to account for this AMS is being utilised as a control for the sensitivity limits for these strain analysis methods, this is in part due to low sample counts, subjectivity and human error. This research uses recently developed and remodified strain analysis methods that are being utilised in a Mathematica environment. The use of Mathematica allows for objective, swift, reproducible and automated calculation of a suite of strain estimate techniques, such as the Fry method, a variation of Ramsay's Nearest Neighbour Method and the Mean Radial Length Method.