Mantle convection: what about the experimental approach ?

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Mantle convection depends strongly on the rheological properties of deep Earth's minerals. Rheology is probably one of the less well known physical property under extreme P, T conditions. The reason is that we don't have yet any machine capable of achieving significant and controlled deformation at high-P, high-T. However, significant advances have recently been made to investigate plastic properties of high-pressure minerals. Most of them have been based on developments of the multianvil technology. On the one hand, the high-pressure assemblies have been modified in such a way that some plasticity is enhanced during a high-P, high-T experiment. Stresses or strains can't be measured and the information withdrawn are essentially microstructural. On the other hand, coupling of the multianvil technology with synchrotron-based diffraction experiments allows real-time measurement of elastic strains. Recent achievements of rheological studies at extreme pressures are presented. Success, pitfalls and perspectives are discussed.