

## **Displacement and strain fields around a [100] dislocation in olivine measured to sub-angstrom accuracy**

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### **ABSTRACT**

We report the first measurement of deformation around a dislocation in olivine at the sub-nanometer scale. The displacement field around a [100] dislocation in olivine from San Carlos, Arizona, was measured using high-resolution transmission electron microscopy and geometric phase analysis. The results were compared with anisotropic elastic theory and are accurate to better than 0.09 Å. The displacements were used to calculate the strain tensor and rigid-body rotation. Together, this information provides a complete description of the local deformation of the crystal around the dislocation. These data could provide an empirical validation for both atomic-scale models of dislocations and mesoscale simulations of dislocation interactions. Details at both of these levels are necessary for a comprehensive forward modeling of mantle rheology.