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Using rotation boundary deformation to infer mechanics of vertical-axis block rotation in southern California.

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Although vertical-axis rotation of crustal blocks has been recognized and studied in every type of tectonic environment, the driving mechanisms and mechanics of this process remain poorly understood. Two outstanding questions are: 1. How is rotation accommodated at depth? and 2. Is rotation driven by stress in the upper brittle crust, or by basal shear in the ductile lower crust. Both these questions can be addressed by looking at the boundaries of rotated areas where rotated crust abuts non-rotated crust. The geometry, diffusity, and kinematics of these boundary zones can indicate the relative movement of crustal blocks, the relative strength of the blocks, the surficial stresses, and the nature of rotational accommodation at depth.

New paleomagnetic and structural data from areas of Neogene rotation in southern California provide clues to the mechanics of vertical-axis rotation. Recent data from the western Transverse Ranges and the Mojave Desert suggest that: 1. rotation is accommodated at depth on discrete surfaces, and 2. rotation is driven by stresses in the upper crust rather than basal traction