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Pacific plate-motion change at the time of the Hawaiian-Emperor bend constrains the viscosity of Earth's asthenosphere

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Important constraints on asthenospheric viscosity come primarily from modeling the glacial rebound of the past 20 kyr, but remain somewhat loose because of the intrinsic resolving power of these models. We obtain narrower bounds by building on the notion that the asthenosphere also controls the ability to change plate motions over Myr. We focus on the Pacific kinematic change at the time of the Hawaiian-Emperor bend event, which is linked to the coeval inception of subduction in the Western Pacific. We sample plausible asthenospheric viscosity and thickness values by requiring the rate at which torque varied to generate the observed kinematics consistent with the nature of subduction initiation. Uncertainties on the bend event duration and the occurrence of Pacific hot spots drift do not hamper our results that suggest that the asthenosphere viscous response to vertical shear over kyr is consistent with that to horizontal shear over Myr.