Anisotropy of the flexural rigidity of continental lithosphere. (I) An application to the Great Basin.

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Anisotropy of the lithospheric strength in the Great Basin, the northern Basin and Range province of Nevada and western Utah, U.S.A, is investigated by the coherence between Bouguer gravity anomalies and topography. Although the effective elastic thickness (Te) of the plate can be estimated using the observed coherence (Forsyth,1985), the usual method obtains an "isotropic" Te. In this study we estimate an "azimuth-dependent" or anisotropic Te. We compute the coherence and evaluate Te in every 10 degrees of the azimuth. The results suggest that Te of the continental lithosphere varies with the azimuth and Te's are found to range from about 6 km to 11 km. The difference between the minimum and maximum values of Te is equivalent to about 6 to 7 times of difference in the flexural rigidity of the lithosphere. The axis of the thinnest Te is within +-10 degrees from the east-west direction; the azimuth of the thickest Te is perpendicular to the thinnest axis. The thinnest azimuth corresponds to the direction of crustal extension during the Tertiary and then is perpendicular to the general strike of the fault system in this region. The elastic anisotropy must reflect the tectonics of this region. The Great Basin lithosphere is given a rigidity structure like a "bamboo blind" through parallel extensional faults and dikes intruding into the crust.