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Strain rate, viscosity, and folding of the subducting slab of the Philippine Sea plate beneath the Ryukyu trench near Taiwan

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The 3-D geometry of the Ryukyu subducting slab determined from relocated seismicity shows a component of folding against the Eurasia with a characteristic wavelength of 250 km. This wavelength, together with the focal mechanisms, are consistent with folding of a viscoelastic layer in a viscous upper mantle by horizontal compression, which is presumably provided by the oblique subduction of the Philippine Sea plate toward Taiwan. The folding model requires that the wavelength be a function of the thickness of the layer, the elastic strain, and the viscosity contrast between the layer and the medium. We calculate the strain rate of the folding part of the slab from the moment tensor solutions in the past 15 years, and translate it (-0.58 x 10**-5 /s) to the elastic strain that initiates the folding, i.e., $\sim$0.04. Combined gravity and topography data constrain the elastic thickness of the Philippine Sea plate in this region at about 20 km. Given two of the three parameters in the folding equation, the third, i.e., the viscosity ratio, can be constrained to be greater than 100. Because the thickness and the ratio trade off each other for the same dominant wavelength, the significance of the ratio will be discussed in the context of the effects of age and temperature on viscosity.