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Landward migration of active folding estimated from topographic developments along the eastern margin of the Japan Sea

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The Quaternary tectonics of the Japan arc is characterized by strongly crustal deformation, whose mode and rate are quite different from those of the preceding late Pliocene. The Tohoku district, on the eastern margin of the Japan Sea, lies within a strongly compressive area that has been experiencing large, contractional, crustal deformations, since the late Pliocene (Sato and Amano, 1991). Fold-and-thrust structures (Sato, 1989) and fold-topographic structures with distributed reverse faults (e.g., Okamura et al., 1995) have developed in response to this contractional deformation. Geodetic surveys in the Tohoku district have detected zones with a high rate of horizontal strain (Sagiya et al., 2000). When the contractional deformation continues to the present, the high strain rate zones at the geological and geodetic scales should be overlapped. However, the high horizontal strain-rates recognized at geological and geodetic time-scales are spatially heterogeneous. Rates are consistent in the Niigata region, in the southwestern part of the Tohoku district, but not in the Akita region in the northwestern part of the district. There is, therefore, a need to constrain the spatial differences in the horizontal strain-rate between the geological and geodetic time-scales, in order to understand regional tectonic differences across the district.

We focus here on the erosional and topographic evolution of fold structures developed since the late Pliocene in the Akita and Niigata regions. We measured the distance between the fold hinge lines and the mountain ridge lines. We targeted 44 folds that were activated since the late Pliocene, comprising 12 and 32 folds in the Akita and Niigata regions, respectively. Spatial variations in the normalized deviations are consistent with the systematic eastward migration of fold growth in the area. The topographic behavior indicates that the landward migrating of the fold growth is generally constant.

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