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Differential deformation rates between the outer and inner arcs of Northeast Japan inferred from Late Quaternary fluvial terraces

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I discuss crustal deformation rates of the central part of NE Japan arc using Late Quaternary fluvial terraces. Fluvial terraces are correlated to marine isotope stages (MISs) by tephrochronology and C-14 dating. The latest and older accumulation terraces are recognized and correlated to MIS 2-4 or 4, and MIS 6, respectively. Regional uplift rates are estimated as ca. 0.17 m/kyr (outer arc) and ca. 0.28 m/kyr (inner arc) using the relative heights of accumulation terrace surfaces. The regional uplift of the inner arc is higher than that of the outer arc. These differential uplift rates between the inner and outer arcs are also shown by using marine terraces in the northern part of NE Japan (Miyauchi, 1990). Crustal thickness increases towards the volcanic front and the crust of the inner arc is about 2 km thicker than that of the outer arc (Nakajima et al., 2002). Thus crustal thickness is consistent with regional uplift rates of the inner and the outer arcs. Assuming that the regional isostatic uplift is caused by crustal shortening, the shortening rates are 0.26 cm/yr (outer arc) and 0.40 cm/yr (inner arc). The strain rates are 0.03 ppm/yr (outer arc) and 0.05 ppm/yr (inner arc). These long-term rates are smaller than the short-term (several-year) strain rates obtained using global positioning system data.

Keywords: fluvial terrace; crustal shortening; northeastern Japan; Late Quaternary