北海道東部の前弧含石炭古第三系褶曲帯中の歪集中と変形バンドの発達

Strain localization and development of deformation bands in a coal-bearing Paleogene fold belt, eastern Hokkaido, northern Japan

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Many studies have recently shown that deformation bands develop in porous sandstones constituting fold and thrust belts. We have analyzed microstructures of deformation bands in one such fold and thrust belt consisting of the Upper Eocence Urahoro Group, Hokkaido, northern Japan, which is typical forearc basin deposits. In the study area (Fig. 1), the folds have a wavelength of c. 1-2 km, the axis of which trends NNE-SSW and plunges nearly horizontally, where the strata generally dip either east or west at moderate angles (Figs. 2 and 3). However, there is one flexure in the eastern part of the study area (Figs. 2 and 3), where deformation bands are pervasively developed only in the Shakubetsu Formation, which contains mudstones and coal layers other than sandstones. In the other parts of the Urahoro Group in the study area, only sandstones occur without the development of deformation bands. Deformation bands could have formed at the maximum burial depth around 1.5 km inferred from the thickness of overlying strata, which conforms to the one (1.5-2.5 km) inferred from the vitrinite reflectance values (%Ro) of the coal layers (c. 0.5) from the Shakubetsu Formation. The deformation bands are inferred to have originated as phyllosilicate bands, which developed into cataclastic bands with increasing strain in sandstones of the Shakubetsu Formation with up to c. 10 volume % of phyllosilicate. In some conjugate deformation bands, a composite vein consisting of pyrite and dolomite intrudes into fractures of detrital grains during the formation of cataclastic deformation bands. In the cataclastic bands, the detrital grains in host sandstones are crushed into the sizes less than a half to one third of the original one, and also flaked during the formation of deformation bands. The latter fact can be revealed by a higher circularity of grains as well as its higher dependence on grain size in the deformation bands than in the host parts.

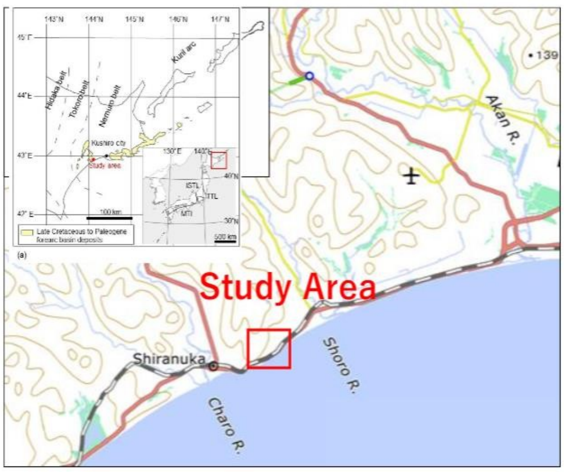

Figure 1. Study area

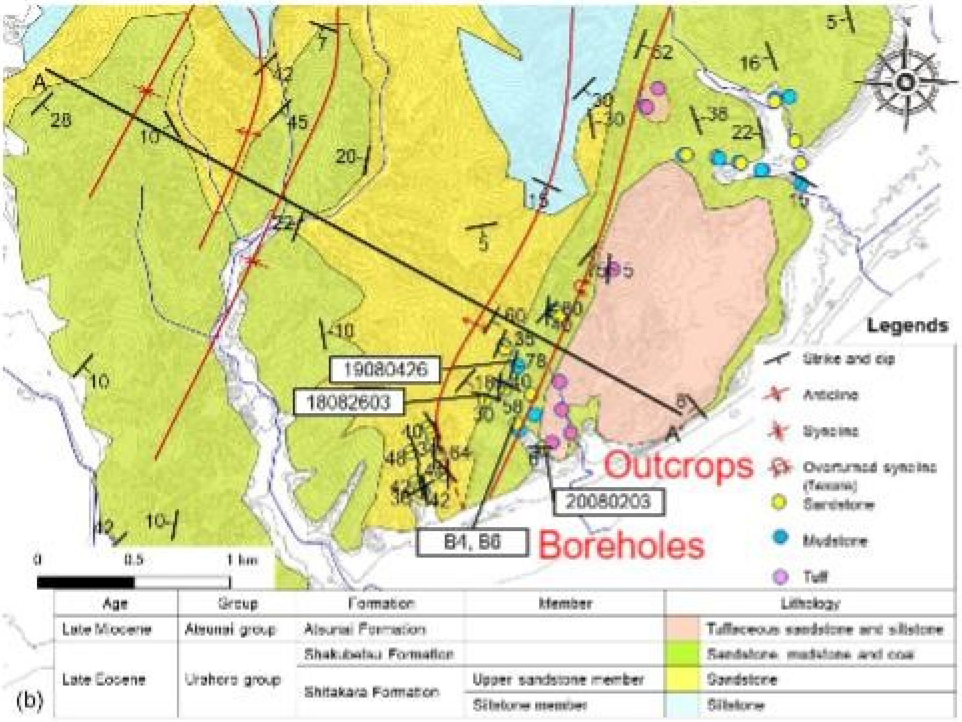

Figure 2. Geological map of the study area modified after Suzuki (1958). Our study points are shown by circles with the colors indicating lithology.

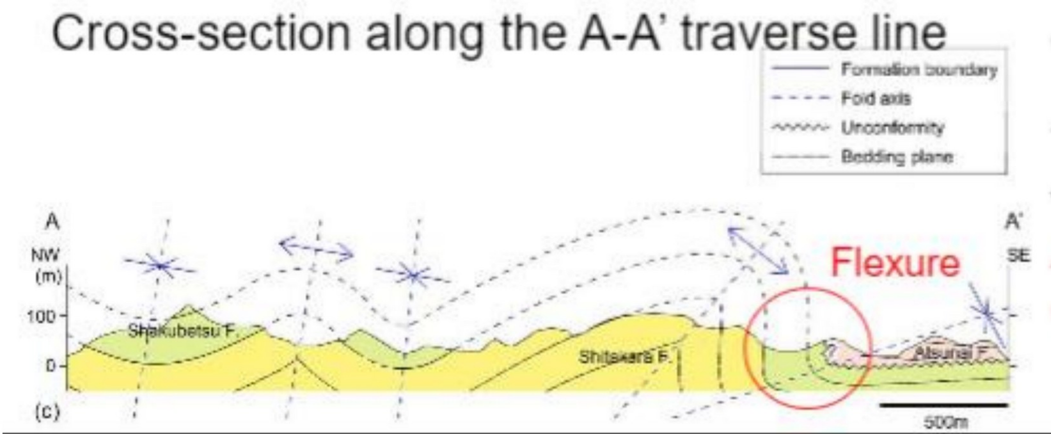

Figure 3. Cross section along the A-A' traverse line (see Fig. 2 for the locality). Note a flexure developed in the SE part.