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High-resolution seismic reflection profiling of the active fold-and-thrust systems in the Shonai backarc basin, northern Honshu, Japan

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Northern Honshu, Japan, forms a classical example of the trench-arc-backarc basin system. Along the coast of the Sea of Japan, Miocene aborted rifts were developed filled with thick Neogene sediments and form an active fold-and-thrust belt. Devastative crustal earthquakes, such as the Shonai earthquake 1894 (M7), occurs historically. To reveal the relationship between active fault and fold structure with seismogenic source faults is significant for the evaluation of seismic hazards and possible risk. In the Shonai plain, northern Honshu, we performed 2D high-resolution seismic reflection profiling across the active faults. Seismic data was collected by 10 m shot and receiver interval using Enviro vib and Minivib (IVI) to obtain high-resolution image. Along some of the seismic lines, seismic reflection survey was recorded by fixed 800-1000 channels, producing high number of folds. The resultant seismic profiles provide the image of a fold-and-thrust belt developed in the Miocene volcanic rift basin. Former syn-rift faults reactivated as reverse faults and thin-skinned deformation prevails in the post rift sediments forming detachment in the Miocene over pressured mudstone units. Fault-related folds and wedge thrusting is common feature of the shortening deformation. There are two active thrust systems in the Shonai basin. One is known active fault system along the eastern margin of the Shonai plain and the other is an active-blind - thrust located in the central part of the basin. The late Quaternary tectonic movements along this fault was confirmed by the high-resolution seismic profiling.