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Changes in illite crystallinity in the Nobeoka thrust fault zone SW Japan, ancient megaspray fault in a subduction zone

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The Nobeka thrust is a fossilized OOST in the Shimanto belts, Cretaceous and Paleogene accretionary complex in SW Japan. A bore hole penetrating the Nobeoka thrust was drilled at Nobeoka city, SW Japan as analogue of NanTroSEIZE project. Total drilling length was 255 m and continuous core samples were recovered. The borehole runs through the Nobeoka thrust at the depth of 41.3m. The hangingwall is mainly phyllite of Kitagawa group and the footwall is cataclacite of Hyuga group (Kondo et al., 2005).

The depth interval between 29m and 78.4m is suffered intense cataclasis due to Nobeoka thrust. Quartz and carbonate veins are enriched in this interval except 41.3-52 m depth interval. We identified from 41.3m to 41.8 m to be a main thrust zone. We also recognize fault breccia at 114m depth.

We collected fragmented core samples from every three meters and analyzed constituent minerals by powder X-ray diffraction. Quartz, plagioclase, illite, chlorite, calcite are main constituent minerals from the top to the bottom. Ankerite sometimes occurs as a vein mineral. Here, we focus on the illite with special reference to fault activity.

We measured IC values (FWHM of illite 001 peak) of 65 samples from the top to the bottom. They show remarkable change between hanging-wall and footwall.

IC values range from 0.14^o to 0.22^o above 38m depth they increase from 0.18^o to 0.30^o in the damaged zone between 38m and 41.0m depth. They range from 0.43^o to 0.58^o just above the Nobeoka thrust between 41.0 to 41.3 m depth. They range from 0.49^o to 0.59^o in the fault core between 41.3m and 41.8m depth, They range from 0.38^o to 0.62^o in the footwall. Here, we focus on the changes in IC values in the hanging-wall.

IC values increase near the Nobeoka thrust. In the damaged zone, the samples are divided into two groups, A and B. In the group A, IC value and peak intensity show negative correlation, whereas, IC values are low and peak intensity is high in the group B. In the fault core, carbonate and clay minerals are enriched and plagioclase content is decreased by intense hydrothermal alteration. The alteration temperature may be lower than the maximum plaetoemperature of Kitagawa group (320 degrees centigrade). This alteration may affect the high IC values in the fault core and the zone just above the fault.

Cray minerals are easily amorphitized by pulverization. IC values should increase during pulverization. We conducted pulverization experiment of illite rich core samples by planetary ball mill. The IC values increased with decresing peak intensity, in a similar relations as that of group A.

Therefore, the increase in IC values in the damaged zone of the Nobeoka thrust result from two processes, which are pulverization (group A) and hydrothermal alteration(group B).

Keywords: cray mineral, megaspray fault, illite