

Provenance for quartzarenite clasts from the Cretaceous the Tetori Group

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Quartzarenite (=orthoquartzite) can be chemically and mechanically regarded as a high mature state judging from high roundness and well sorting of detrital quartz grains. Quartzarenite clasts occur at several places of the Japanese Islands, but their provenance has not been known from the Japanese Islands. Originally, quartzarenite is an aeolian deposit derived from strongly weathered basement rocks of granite or gneiss. The provenance of quartzarenites clasts from the Japanese Islands seems to have been located in the Asian continent.

In this study, we studied the paleogeographic reconstruction inferred from quartzarenite clasts of the Cretaceous Tetori Group; 1) how long were they transported through? and 2) where was the provenance?

First, to consider 1) how long were they transported through? , how much did size of quartzarenite clasts decrease downstream along the present river? The selected river is the Nakdong River in Taebaek city, 190km south-southeast of Seoul, Korea. The Jangsang Formation (a part of the Okcheon belt) is distributed in the upstream area of the Nakdong River. The quartzarenite sequence of the Jangsang Formation is characteristic of pink color. It is relatively easier to collect quartzarenite clasts due to its pink color in the river beds. More than 100 quartzarenite clasts of the Jangsang Formation were collected at 10 localities downstream and their clast sizes were measured. Also, more than 100 quartzarenite clasts from the Akaiwa Subgroup of the Tetori Group were collected at four localities; one locality at Akatani-gawa, one locality at Yatsume, and two localities at Byakko-dani. Based on measured clast size values, it is inferred that quartzarenite clasts of the Tetori Group were transported 170-210km.

Second, to estimate 2) where was the provenance? , the optical microscope observation was carried out. Samples are quartzarenite from the Jangsang and Dongjeom formations in the Okcheon belt, and 20 quartzarenite clasts of the Tetori Group at the Byakko-dani. Quartzarenite clasts were classified into three types by degree of their recrystallization under the optical microscope. To observe their details, the quartzarenite clasts of the Tetori Group belonging to the same type as the Korean samples were observed under the cathodoluminescence microscope. Cathodoluminescence microscope is an effective tool to study diagenesis and provenance of detrital quartz grains. It's possible to detect each detailed detrital quartz grain under the cathodoluminescence microscope. For example, for luminescence color, red luminescence is volcanic in origin and blue luminescence is plutonic in origin. Therefore, it's possible to estimate the provenance. However, it is difficult to make a quantitative analysis because a very short period of transition from blue to red luminescence in a few seconds in the case of weak luminescence such as quartz.

In this study, as a result from 1) and 2), it is probable that the estimated provenance area for the Tetori Group covers the nearly same area corresponding to the extension of the Okcheon belt.