The stratigraphy and a new age constraint of the volcaniclastic sequence of Birimian in Cape Three Points, Ashanti belt, southwest Ghana

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Paleoproterozoic Birimian greenstone belt, extending from eastern Guinea to western Niger, is located in southern part of West Africa Craton. The geological structure of the Ashanti belt occupying most of western Ghana, especially gold mines, has been revealed a little by scientific research. At the Cape Three Points area, there is no previous report about change in environment of deep sea floor during paleoproterozoic period. We focused on environment and bioactivities during deposition of protolith of the Birimian greenstones at this region. As a preliminary study, we report the stratigraphy, structures of volcanic and volcaniclastic sequence, the depositional settings and age at this region.

Ashanti belt, striking NE-SW and occupying most of western Ghana, is composed of mainly basalts or andesites, volcaniclastic rocks and belt type or non-belt type granitoids, and is uncomfortably overlain by acidic volcaniclastics and gold bearing conglomerates. The maximum depositional age of the cap of Birimian rocks is 2154±2 Ma (U-Pb zircon: Oberthür et al., 1998) and the youngest age of the intruded rock into Birimian volcanic in this region is 2174±2 Ma (U-Pb zircon: Oberthür et al., 1998).

In the Cape Three Points region facing the Gulf of Guinea, very thick volcaniclastic sequences are present in succession over 4000 m and about 1000 m-thick of stratigraphy of the study sites is reconstructed by detailed field investigations. The layers are running N-S, most of them dip 60-80 to the east. The stratigraphy shows fining upward. All of these sediments were affected by greenschist facies metamorphism, and thus minerals of amphiboles, plagioclase, chlorite and epidote are very common, while quartz grains are not so popular member here. The TiO_2/Al_2O_3 ratio obtained from chromites with EPMA in basaltic rocks indicates that these rocks produced in the volcanic arc system. Trace elements compositions of whole-rock compositions tend to show low concentration of Nb, and high concentration of LREEs. These facts also indicate that they are derived from volcanic arc region. Those thick finning-upward volcaniclastic sequence, chemical compositions may be suggest that the Cape Three Points area was formed on the mid-deep sea floor beside an oceanic volcanic arc.

We obtained new age information from the porphyritic dyke with several meters in length and <1m in widths. This dyke is foliated and some minerals are sheared and tone off. Zircon grains collected from the dyke were measured by SHRIMP at NIPR, and yielded weighted mean ^{204}Pb-corrected ^{207}Pb/^{206}Pb age of 2265.6±4.6 Ma (95% confidence), which indicates that the volcaniclastic sequences deposited before 2265.6±4.6 Ma and deformed after that. Only four detrital zircons are dated around 2260 Ma in this site and these age groups are the oldest in the Ghanean greenstone terrene (Loh and Hiedes 1992). Therefore, there is possibility that the early volcanic activity history of the Ghana Birimian remains at Cape Three Points.

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