Stratigraphy and Age Constraint of Birimian Volcanoclastic Sequence in the Ashanti Belt, Southwest Ghana

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Paleoproterozoic Birimian greenstone belt, extending from Guinea in the east to Niger in the west, and located in southern part of the West Africa Craton. There are many publications on the geological structure of the Ashanti belt, especially gold bearing areas. However, not much has been done in the Cape Three Points area particularly on the paleoenvironmental evolution. This study on this region and considered the depositional environments of the Birimian greenstone and the bioactivities at the time of deposition. Our research outlined the stratigraphy and structures of volcanoclastic sequence of Cape Three Points area in the Ashanti belt and constrained the depositional age by SHRIMP U-Pb dating of zircon.

Ashanti belt strikes NE-SW and occupies most of western Ghana, is composed of mainly andesitic basalts, volcaniclastic rocks and belt type and basin type granitoids. The Birimian greenstone is uncomfortably overlain by gold bearing Tarkwaian conglomerates and metasedimentary rocks. The maximum depositional age of overlying metasedimentary rocks is 2154±2 Ma (U-Pb zircon: Oberthür et al., 1998) and the oldest age of the intruded rock into Birimian volcanic in Sekondi region is 2174±2 Ma (U-Pb zircon: Oberthür et al., 1998).

In the Cape Three Points region facing the Gulf of Guinea, thick volcaniclastic sequences are present in succession over 4000m and about 1000 m-thick of stratigraphy of the study sites is reconstructed by detailed field investigations. The rocks strike approximately N-S, generally dip 60-80º to the east, show fining upward stratigraphy and they were affected by greenschist facies metamorphism. TiO_2/Al_2O_3 ratios from EPMA analyses of chromites in basaltic rocks from the basal portion of the stratigraphy suggest that these rocks originated in a volcanic arc system. Trace elements compositions of whole-rock tend to show low concentration of Nb, and high concentration of LREEs. These also support derivation from volcanic arc. This thick finning-upward volcaniclastic sequence and chemical compositions may suggest the Cape Three Points formation was deposited on mid-deep sea floor beside an oceanic volcanic arc.

New age data from porphyritic dyke which occurs several meters in length and <1m in widths was obtained. This dyke exhibits foliation and some minerals are sheared and brecciated. 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 afterwards. This age around 2265 Ma is the oldest in the Ghanean greenstone terrane (Loh and Hirdes, 1999). It would seem, therefore, that rocks in the Cape Three Points area may record the history of early volcanic activity in the Birimian of Ghana.

References

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