Provenance and Tectonic settings of the Cretaceous Clastic rocks in the Northern Bida basin, North-Central Nigeria: Constrain from Geochemistry, Detrital Zircon Morphology and Typology

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The Campanian-Maastrichtian clastic rocks of the Bida and Enagi formations of the northern Bida Basin, north-central Nigeria are analyzed for their whole rock geochemistry (trace and rare earth elements) and detrital zircon morphology to infer the tectonic settings and provenance signatures. The trace and rare earth elements proxies; La/Th, La/Co, Th/Co, La/Sc, Cr/Th, Zr/Nb and Zr/Th of the sandstone sediments are indicative of a felsic provenance. Chondrite-normalized REE patterns, light REE enrichment, heavy REE flat pattern and negative Eu anomalies corroborate the felsic source and favor within craton interior to orogenic recycled sources and deposited in a passive continental margin setting during the Cretaceous. Discrimination plots; La/Y versus Sc/Cr, La-Th-Sc and Th-Sc-Zr/10 also indicate passive continental margin paleotectonic settings. A higher Zr/Sc and Zr/Hf ratio with Th/Sc and Zr/Sc binary plot reflects considerable zircon enrichment in the source area. Morphological studies of the detrital zircon using cathodoluminescence (CL) reveal well-developed pyramid {101} and two prisms {100} - {110} that fall in P1-P5 subtypes. High population of prismatic and lamellar detrital zircon types with a well-developed oscillatory zoning typical of magmatic crystallization and sub-population of short and acicular types that characterizes preservation of crustal rocks indicate changes in the primary sources during depositional history. The prismatic and lamellar detrital zircon types with a well-developed oscillatory zoning observed in Bida Formation is typical of magmatic crystallization whereas distinct populations of short and acicular types in Enagi Formation characterizes preservation of crustal rocks. In conclusion, this study revealed that main sediment input in the northern Bida Basin Nigeria is from Precambrian Basement Complex with possible mixing from two igneous source materials.