Efficacy of Stream Sediment Survey in delineating geochemical halos: A case study of well and non-shed areas in the Gambe-Tola Baryte District, Northeastern Nigeria

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ABSTRACT

The efficacy of stream sediment survey in delineating geochemical halos is assessed in the Gambe-Tola Area of Northeastern Nigeria. Well-shed area had a higher statistical probability of being associated with geochemical halos synonymous with elevated concentrations in the rocks whereas less shed shed areas sometimes showed little or no correlation to elevated concentrations in the rocks. Efforts to trace known Baryte mineralization in the area through geochemical halos from stream sediment was unsuccessful as the mineralized areas were not well shed, due to large dispersion distance at sampling and natural solubility of $BaSo_4$ in water.

Keywords: Stream sediment, Gambe, Tola, Baryte, Northeastern Nigeria

1.0 INTRODUCTION

Stream sediment survey has proved useful in delineating mineralizations and is a popular technique especially used for regional studies in well shed areas (Steele and Wagner, 1983; Fletcher, 1997; Labuschagne et al., 1992; Naseem et al., 2002; Rice, 1999). This study tests the efficacy of stream sediment survey in delineating Baryte mineralization iin well shed and less shed areas.

2.0 GEOLOGIC SETTING

The area of study falls within the Precambrian basement complex of NE Nigeria which in the context of African geology is a part of the Pan-African mobile belt forming the eastern flank of the West African craton (Woakes and Bafor, 1982). Early works on the northern basement complex began with the work of Falconer, 1911 who published the geology of parts of the basement and the neighboring chad basin. Carter et al., 1963 identified by regional mapping that

the north eastern basement complex include migmatites, granites and granite gneiss. Ekwueme, 1993 further expanded on this observing that the basement rocks of Northeastern Nigeria comprises of migmatites, gneisses, dolerite, porphyritic granites and volcanic rocks. The Tola area which is located at the tip of the Eastern basement complex (Fig 1) is composed of granitic rocks, gneisses and alluvial deposits (Fig 2)

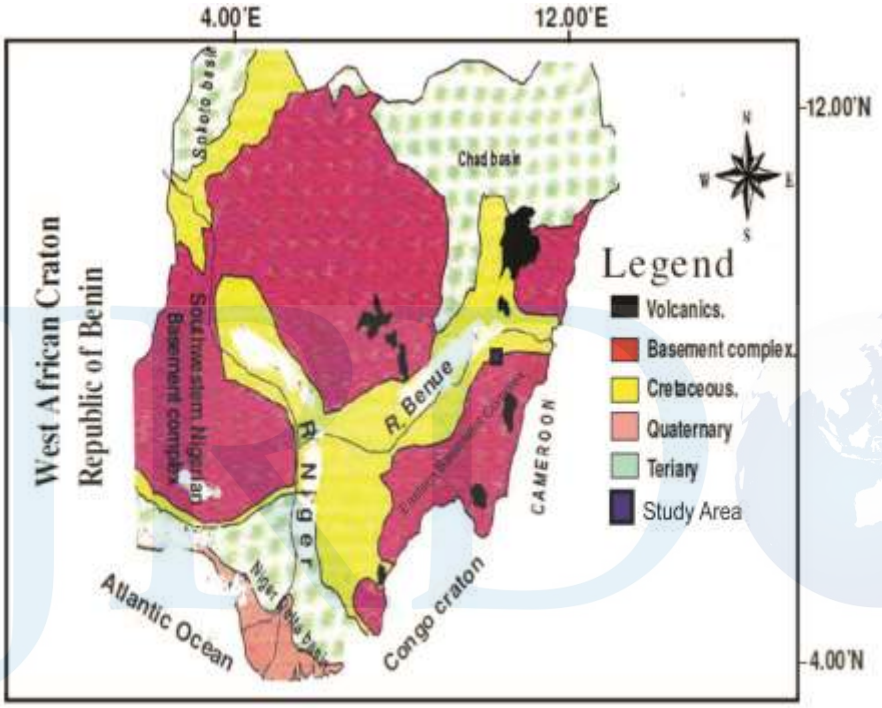

Fig 1. Map of Nigeria showing the eastern basment complex

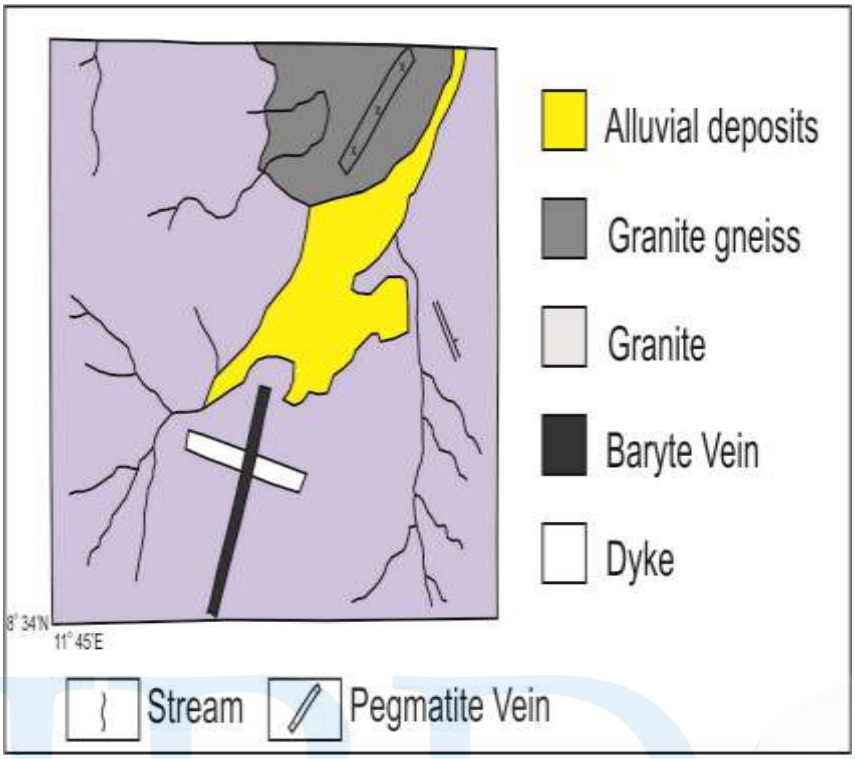

Fig 2. Geologic Map of the Tola Baryte Deposit

3.0 SAMPLING AND ANALYTICAL TECHNIQUES

Systemic sampling of grided areas suspected to contain baryte bearing veins were assayed for exploratory purposes. Stream sections and rock cuts showing mineralization were also sampled. The rock cuts and soil samples are the focus of this study.

The samples were pulverized and sent to the Activation Laboratories, Canada for major and trace element geochemistry. The samples were analyzed using a X-ray Flouroscene machine and an Induced Coupled Plasma Mass Spectrometry (ICP-MS). Accuracy and precision are better than 3-5% (RSD) for most elements and about 5% for some transition elements with detailed analytical procedure being described elsewhere (Liu et al., 2008).

4.0 RESULTS AND DISCUSSIONS

The stream sediment sampling (shown in Fig 3) showed greater halo markings matching the geochemical makeup of the surrounding rocks the more well shed the area was.

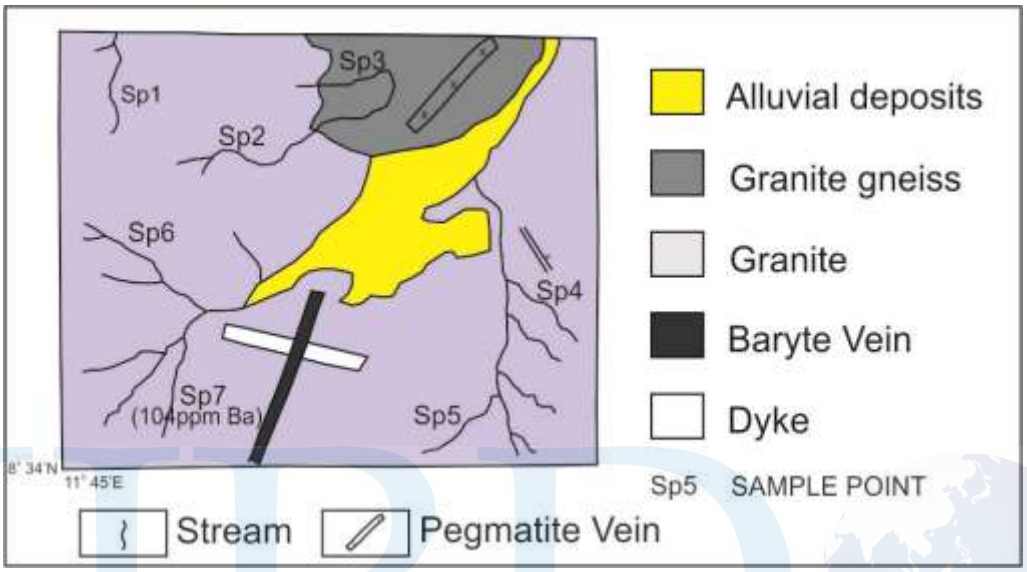

Fig 3. Map of the Area showing distibution of streams and sample points

Samples 6 & 7 plus samples 5 and 4 showed greater data values by a factor of 1.9 when compared with samples 1,2 and 3. Samples 1 showed no correlation with rock data values of the underlying granite with Samples 2 & 3 showing little correlation (0.4) with background data.

Due to certain factors (large dispersion distance of sampling and nature of stream sheds in the area), the sediments collected away from a mineralized baryte vein found in the area failed to showed enriched values that will typically be associated with mineralization and thus if concealed then stream sediment surveying of the area would have missed the mineralization.

5.0 CONCLUSIONS

Geochemical anomalous elements in rocks of the Gambe-Tola area where statistically more pronounced in stream sediments in areas where the rocks where well shed as compared to less shed area where the rocks showed little or no statistical correlation.

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