

## GEOLOGY OF THE N.E ANGOLAN KIMBERLITE REGION.

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## ABSTRACT

The Northeast of Angola known as Lunda, is one of the greatest regions of the Diamond Provinces of Africa where gem diamonds have been exploited for almost a century .

In the late cretaceous a period of rapid erosion occurred, giving rise to piedmont conglomerates with sandstones and other sediments which formed a secondary type of diamond deposits known as "Calonda Formation".

The first kimberlites were discovered from the diamond satellite minerals ( chromdiopside, pyrope and ilmenite ) found in the heavy fraction of alluvial gravel .

The platform basement of the region is fractured by a number of faults of N.E and latitudinal directions. what can be seen from a sporadic development of the metamorphic rocks of the Luana group and karroo sediments .

In the region kimberlite intrusion occurred before the fundamental change of its general structure: up to the cretaceous time structural and facies zonation was determined by the latitudinal faults .

The first paleotectonic maps of Lunda region were made to establish criteria for more effective prospection and exploration works, and to assist those who devote to the study of Angolan diamond geology in discovery of new diamond primary deposits .

## INTRODUCTION

Corrent angolan diamond production is from river beds, alluvial flats, terrace and eluvial deposits.

Although the diamond exploitation was made in this area during many years, its geology is still little known. This fact has made it difficult to determine the general regularities of the primary and secondary diamond ore-bedding formation, as well as the choice of guidance and more suitable prospection methods of the kimberlite and other deposits .

Based on the research carried out in the kimberlite of this region, the paleotectonic conditions of cretaceous kimberlite magmatism indications and alluvial diamond formation are hereby examined for the first time .

## LUNDA GEOLOGICAL FRAMEWORK OF KIMBERLITES

The territory of Angola has complex geological structure. It belongs to the precambrian african platform .

Tectonically, Lunda region includes the western slope of the shield Cassai adjacent part of Cassanje depression. The gneiss-migmatites and granulites are the most represented precambrian rocks from the part of the shield in question.

The most recent pre-cambrian rocks preserved in fragments, are detached in the Luana group represented by quartzic sandstones, quartzites and greywacke, with metabasaltic layers in some places .

From the phanerozoic coverage formations, locally preserved in the Cassai shield flank, the oldest are the continental deposits of the karroo system ( C<sub>3</sub> - T<sub>1</sub> ) .

More recent, the Calonda formation is represented by fragments in the shield flank preserved in the form of erosion witnesses in the precambrian rocks.

In the Cassai shield the deposits in question are characterized by the considerable facies lateral change that enable to determine the formation conditions of old fluvial valleys with placer deposit of cretaceous.

The above characterize rocks of the crystallin basement and covering ones are recovered by partial erosion by the red continental deposits of the paleogenic-neogenic kalahari group.

The accumulative quaternary terraces of the region were mostly formed in the weathering process of the Calonda formation deposits and of the cretaceous kimberlites, that is why there are rich diamond bearing placer deposits in some places.

In the Northeastern Angola, platform magmatism of cretaceous are well developed: kimberlites and complex of alkalic rocks.

The kimberlites are dated between 80-120 m.y. and are represented by the breccia and massive varieties. The most recent alkalic complexes are composed of sienites and phonolites.

It should be pointed out that the alkalic complexes are located within the granite - gneissic ovoids of the basement, whereas kimberlites area associated with the intra-ovoid zones. This witnesses the influence of the basement structures and corresponding old disuniformities in the platform magmatism process.

#### GEOLOGICAL EVOLUTION OF THE CASSAI SHIELD AND RELATED DIAMOND ORE-BED FORMATION

The geological development of the Lunda region (Cassai shield) can be followed from the upper proterozoic when the covering deposits of the Luana group were accumulate in the archaic consolidated basement, crossed by the lower proterozoic granites.

At the end of the lower proterozoic there was the uprising of the west flank of the shield followed by the intrusion of alkaline granitic and alkaline complexes and movement of embasement blocks.

In the lower and medium proterozoic, Lunda region was upraised and weathered, the first differentiated vertical movements appeared in the upper paleozoic-triassic.

At that time, two intra-continental depressions of the graben type were individualized perpendicularly oriented: one in the west-submeridional with which the formation of Cassanje depression started, and another of the N.E-SW direction along the lineation gabbro-noritic of archaic. In jurassic most of the Lunda region was expressed by the uprising of the shield, submitted to the planar erosion.

At the end of jurassic initiation cretaceous, the western edge of the Cassai shield suffered heavy tectonization according to the same fault systems of sub-meridional and NE-SW direction. The cataclasis was followed by the kimberlites intrusion which shows the connection of the faults with a very deep tectonomagmatic system.

The important changes in the geological development of the Lunda region occurred in the cretaceous. According to the distribution of the deposits of this age, it was possible to reconstitue the complex system of the graben type depressions on the boundaries of the Cassai shield (fig.1).

The greatest depression along the western edge of the shield coincided in general with the main area of the earlier kimberlitic magmatism.

The thick granularity of the cretaceous continental deposits developed in the western part of the Cassai shield, indicates their formation in the valleys. According to the distribution of these sediments it is possible to reconstitue the old ramified river system of creta-

aceous falling into the north, running off to the close depression of lacustrine type of the Congo sineclise in which the sandy-clay deposits were greatly accumulated ( Fig. 1 ) .

The slope process and rivers falling into the north of the western edge of the Cassai shield, along the tectonic depressions weathered the lower cretaceous kimberlites which conditioned the formation of diamond bearing alluvial deposits of this age .

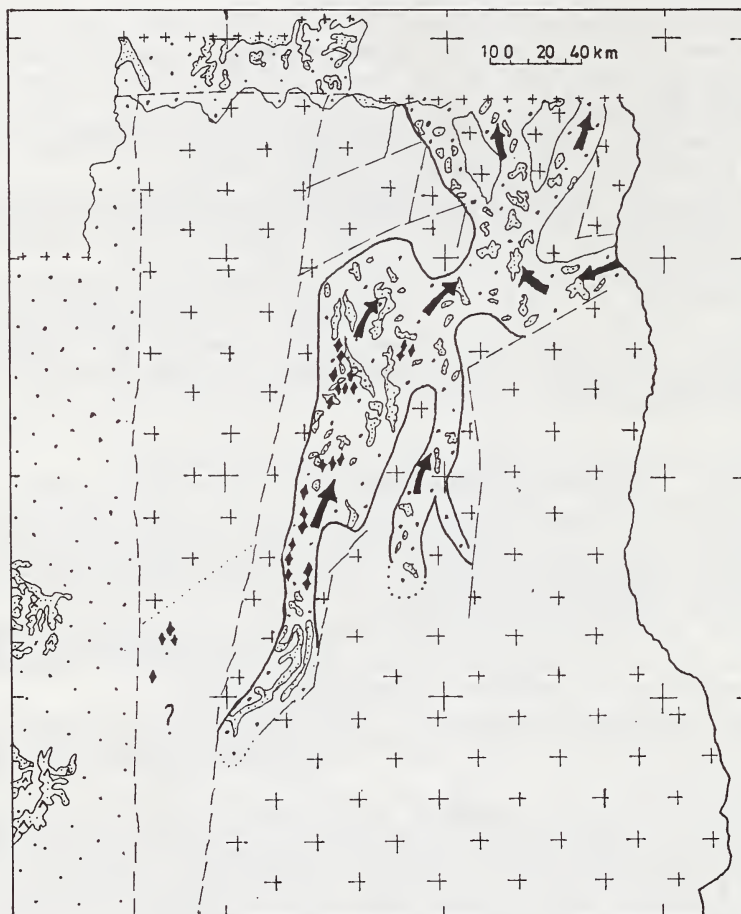


Fig. 1 - PALEOTECTONIC SCHEME DURING CRETACEOUS



- 1 - Basic Complex; 2 - Area of Cretaceous Deposits Development;  
3 - Area of Present Cretaceous Outcrop; 4 - Complex of Alkaline Rocks;  
5 - Faults; 6 - Kimberlites; 7 - Hydrographical Network Orientation

### CONCLUSIONS

1. The platform development of Lunda region, initiated in the upper proterozoic was guided by the deep faults of two main directions sub-meridional and NE-SW: the deepest were probably the faults of the last direction which inherited the archaic gabbro-noritic lineation. Precisely on the crossing with the meridional faults the lower cretaceous kimberlites introduced .

2. The assessment of data enabled to outline the old fluvial arteries from the development of which resulted the accumulation of the diamond bearing placer deposits.

3. The outlined sequence of the geological development of the Lunda region can be used as general scientific basis for drawing up the further study programmes of its diamond bearing potential. That sequence enables us to determine the likely location of the kimberlites and lamproites not yet detected, the ways of transport and its diamonds during the cretaceous and cenozoic .

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