COMUNICACIONES N° 50 (1999): 39-42

GOLD DISPERSION IN AFRICAN SEMI-ARID ENVIRONMENT

JEAN-CLAUDE PARISOT[1], SERIGNE DIENG[2], OUSMANE BAMBA[3]

[1] *IRD, BP 1386, Dakar, Sénégal*
[2] *IRD – UCAD, BP 1386, Dakar, Sénégal*
[3] *IRD – CEREGE, BP 80, 13545 Aix en Provence, France*

KEY WORDS: Africa, gold, laterite,

INTRODUCTION

In West Africa, birimian volcano-sedimentary formations are suitable for gold exploration. Thick lateritic weathering mantles often overlie these formations. Lateritisation processes homogenize the weathering products with an intense leaching of the main constituents of the parent rock and a mineralogical reorganization of silica, alumina and iron oxide. That impedes frequently identification of the parent material. Thus, the lateritisation that transforms indifferently *in situ* materials and transported materials complicates prospecting of residual metals as gold.

The native gold is malleable and not fully resistant to leaching so that the morphology of gold grains may effectively reflect mechanical erosion and/or chemical weathering processes. Thus, the surface aspect of gold particles could record the different stages of the morphoclimatic history of the environment in which they had evolved (Hérail et al., 1990; Parisot et al., 1995).

West African landscape exhibits remnants of different flattening surfaces whose older bear ferricretes. The majority of these surfaces are interpreted as glacis (Michel, 1973; Grandin, 1976). The distribution and the morphology of gold particles are studied in this environment near two mineralized areas in Burkina Faso and Senegal.

GOLD DISPERSION

In the Bantakokouta area, eastern Senegal, a mineralized quartz vein outcrops at the edge of a plateau bearing a ferricrete. A gravel material coming from the dismantling of ferricrete covers slope of the plateau. This material is more and less hardened and reaches 5 m in thickness (fig. 1a). In Larafella, Burkina Faso, the regional landscape exhibits three flattening surfaces covered by ferricretes. Two old units are plateaus with respective altitudes of 300 m and 280 m. The third unit is a large recent pediment extending between 265 and 250 m where outcrops the gold mineralization that occurs in albitite formation (fig. 1b). Distribution and morphology of gold particles are studied within borehole profiles dug within the different geomorphological units. At Bantakokouta, five profiles are studied downslope on a distance of approximately 300 m. At Larafella, one profile is studied in each geomorphological unit, the sequence of pits have approximately 1000 m in length.

From the bottom to the top of the profile, above the mineralization, the evolution of gold particles is very similar in the two areas. The gold particle content and particles size decrease and the proportion of gold particles with blunt shape and dissolution cavities increases. However at Larafella, the saprolite presents less than 20% of gold particles with blunt surface and less than 10% with dissolution cavities while at Bantakokouta these proportions reach 65% and 40% respectively. Leaching is less intense at Larafella where geomorphological unit bearing the mineralization is younger than that of Bantakokouta. Within ferricrete, the coarse fraction (>1mm) containing ferruginous nodules show a higher gold particle content than the soft matrix (<1mm fraction) (fig. 2A).

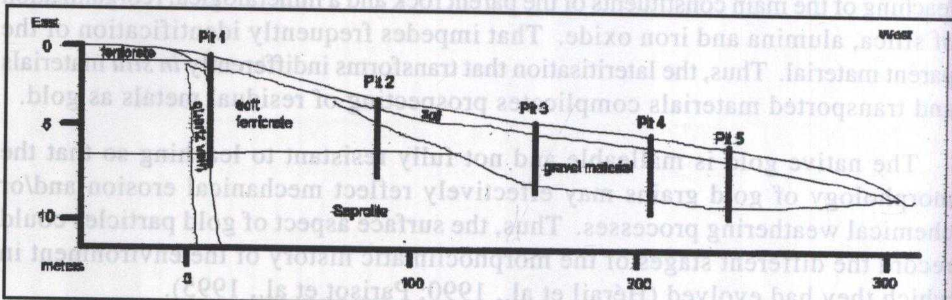

Figure 1a: Studied sequence of Bantakokouta

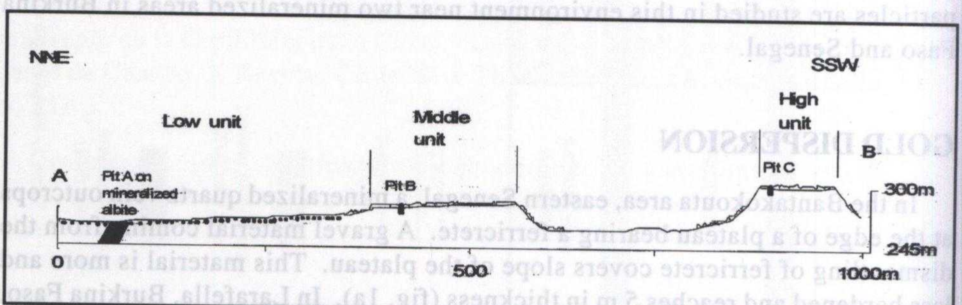

Figure 1b: Studied sequence of Laraffela.

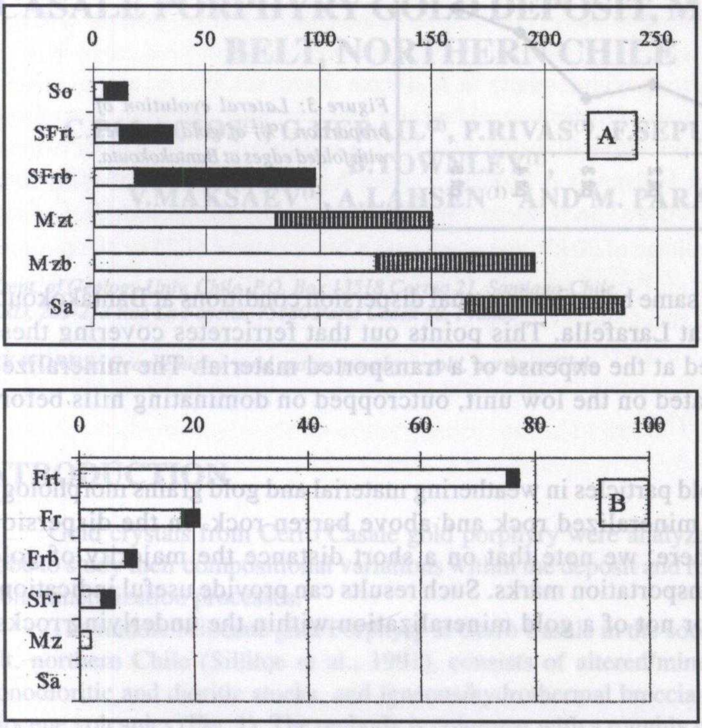

Figure 2: distribution of gold particles / kg of sample within the different geomorphological units of Laraffela. White box = fraction <1mm, black box = fraction >1mm (Fe nodules), hatch box = fraction >1mm (quartz).
A - Low unit; So=Soil, SFrt = top of soft ferricrete, SFrB = bottom of soft ferricrete, Mct = top of mottled clay layer, Mcb = bottom of mottled clay layer, Sa = saprolite.
B - Middle unit; Frt = top of ferricrete,
Fr = ferricrete,
Frb = bottom of ferricrete,
SFr = soft ferricrete,

Laterally, within slope profiles of Bantakokouta as within older units of Larafella, gold particles are only observed in gravel material and ferricrete respectively. Saprolite being sterile since the parent rock is not mineralzed. At Larafella, gold particle contents recorded at the surface are comparable to those measured above the mineralization while at Bantakokouta gold particle contents decrease to the periphery. From mineralization to periphery, gold particle size decreases. From the top to the bottom of profiles, gold particle content and particle size decrease and particles are mainly found in the matrix (<1mm fraction) (fig. 2B).

All gold particles present a blunt surface. At Bantakokouta, from mineralization to periphery, proportions of particles with folded edges and affected by scratchings increase and reach 40 % and 50 % respectively (fig. 3). In the older unit of Larafella area, these proportions reach 100 % and 75 % respectively.

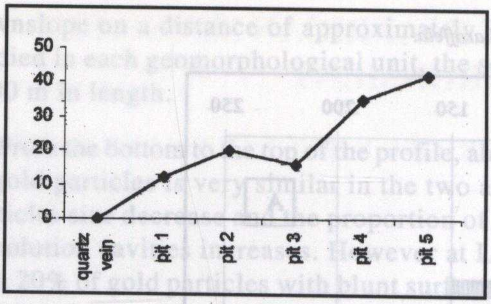

Figure 3: Lateral evolution of proportion (%) of gold particles with folded edges at Bantakokouta.

Gold presents the same behavior in actual dispersion conditions at Bantakokouta that in older glacis at Larafella. This points out that ferricretes covering these old glacis are formed at the expense of a transported material. The mineralized source, actually located on the low unit, outcropped on dominating hills before the relief inversion.

Distribution of gold particles in weathering material and gold grains morphology are different above mineralized rock and above barren rock. In the dispersion conditions studied here, we note that on a short distance the majority of gold particles presents transportation marks. Such results can provide useful indications about the presence or not of a gold mineralization within the underlying rocks.

REFERENCES

Michel, P., 1973. Les bassins des fleuves Sénégal et Gambie. Etude géomorphologique. Mém. ORSTOM, 63, Paris, 752 p.

Parisot, J-C., Ventose, V., Grandin, G., Bourges, F., Debat, P., Tollon, F. and Millo, L., 1995. Dynamique de l'or et d'autres minéraux lourds dans un profil d'altération cuirassé du Burkina Faso, Afrique de l'Ouest. Intérêt pour l'interprétation de la mise en place des matériaux constituant les cuirasses de haut glacis. C.R. Acad. Sci. Paris, 321, II, p 295-302.

Hérail, G., Fornari, M., Viscarra, G. and Miranda, V., 1990. Morphological and chemical evolution of gold grains during the formation of polygenic fluviatile placer : the Mio-Pleistocene Tipuani placer example (Andes, Bolivia). Ch. Recherche Minière, 500, p 41-49.

Grandin, G., 1976. Aplanissements cuirassés et enrichissement des gisements de manganèse dans quelques régions d'Afrique de l'Ouest. Mém. ORSTOM, 82, 275 p.