

**GEODYNAMICS OF THE BOLIVIAN ANDES AND FORMATION
OF THE ALLUVIAL GOLD DEPOSITS**

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The alluvial placers result from on the one hand, the erosion of primary, in rock mineralizations, or from the erosion of older secondary gold concentrations or from a mixing of the two process, and on the other hand from the concentration of gold and heavy minerals in the sediments deposited by the co-related erosion.

So their formation is linked with the bulding of reliefs, the time when the erosion reaches the primary mineralizations, and the presence of traps which can retain selectivly the auriferous material produced by the erosion.

In many cases the placers are scattered and of reduced economic interest. However, peculiar structural and morphological conditions can favour the trapping of big volumes of auriferous sediments as, for instance, in the North of Bolivia.

In this area, placers deposits occur in the both slopes of the Cordillera Oriental, c.a. in the Altiplano (SW) facing slope and the Amazonian (NE) facing slope. However the conditions of their formation differ.

The fluvio-glacial placers (1) particulary those of the Basin of Ulla-Ulla, near the border with Peru occur in Quaternary alluvial sediments; these materials mainly consist of tills and out wash conlomerates and contain gold only if they result directly from the erosion by the glaciers of primary mineralizations. In this case the

geomorphological features are more important than the structural features to explain their genesis.

Near the town of Oruro, in the area of Caracollo, the small placers which occur, result from the Quaternary reworking of Cenozoic conglomerates (Formation Kollpana). The deposition of these conglomerates is related to the motion toward the SW of a thrust which corresponds to the South branch of the Coniri Fault, one of the major thrust plane of the Altiplano. In this case,

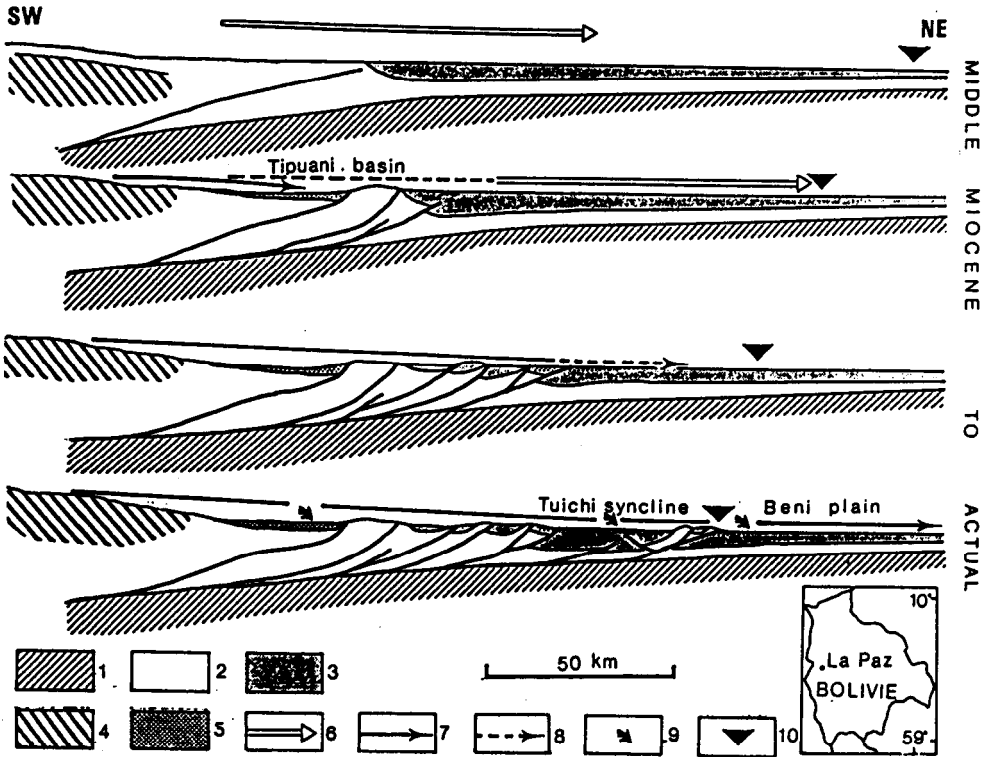


Figure 1 : Structural evolution and gold-bearing placers generation on the eastern side of the Andean Cordillera, North of Bolivia, and its piedmont

1- Pre middle Ordovician strata. 2- Units subsequent to Mid-Ordovician. 3- Sediments deposited on the piedmont since Lower Miocene. 4- Main primary gold mineralizations areas. 5- Middle-Miocene to Pliocene gold-bearing conglomerates. 6- Rivers with sterile bedload. 7- Rivers with auriferous bedload. 8- Rivers with low gold content bedload. 9- Rehandling of the Mio-Pliocene gold-bearing conglomerates by Quaternary erosion. 10- Imaginal point showing the underthrusting of the Brazilian shield. Owing to uplift of Eastern Cordillera, gold mineralizations crop out during the Mid- to Upper Miocene. The correlated sediments are deposited in subsiding basins, in relationship with the subandean front thrusts, subsequent to underthrust of the Brazilian shield by the Cordillera.

the Formation Kollpana is an "intermediary collector" of tectonic origin and the placers formation is related to both structural and morphological features.

In the Amazonian slope of the Cordillera in its piedmont (fig.1) the gold placers are more widespread. Numerous deposits correspond to sediments of the recent terraces and the bed of the rivers; they result from the erosion of nearby primary mineralizations.

This kind of placers occurs in most of the valleys that go down from the Cordillera (Pellechuco, Consata, Tipuani, Challana river) but the specificity of this area is the presence of big placers, such as those of the Tipuani-Mapiri basin or of the syncline of the Tuichi river (2,3).

These latter placers result from a long and complex process, important quantities of sediments ( Cangalli Formation, Tutumo Formation) were trapped and accumulated since the middle Miocene in wide (3000-5000 km<sup>2</sup>) hollows. In these materials, some placers of economic interest occur, particularly at the bottom of the proximal paleo-valleys but generally the grade is infra-economic. However these materials provide gold particles to the river which erode them, and serve of intermediate collectors allowing, so, the formation in the actual rivers of placers deposits of economic interest. The grade becomes higher than in the source sediments and poor formation change by successive reworking to economic deposits.

It appears that during the building of the Andes in the North of Bolivia, the gold transported by the rivers was not totally trapped in the Cordillera, and that some gold particles reached the piedmont area. During the development of the Andean Orogeny, reliefs and hollows are created which are younger and younger toward the foreland (toward the NE); they are related to the formation of successive thrusting fronts and piggy back basins.

This tectonic process starts at the end of the Oligocene and if, for the time being, detrital gold is known only on and after the middle Miocene, it is probably because only at that time, the erosion reached the primary mineralization.

## References

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