ALLOCHTONOUS TERRANES IN NORTHWESTERN ECUADOR

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Resumé

A brief desciption is given of previous work, lithologic assemblages, tectonic events, structures, suture zones, metallogenic environment and geodynamic evolution of the Ecuadorian Northwestern Cordillera.

Key words : accreted terranes, island arc, back-arc, sutures.

Introduction

Previously, the Ecuadorian Western Cordillera was interpreted as an island arc, accreted in the Late Cretaceous (Henderson 1979).

An Eocene island arc and back-arc sequence on top of an accreted fragment of Cretaceous oceanic crust is the interpretation resulting from more recent investigations. Continental type calc-alkaline arcs, from Upper Oligocene to recent, rest unconformably on top of above units (Eguez 1986, Lebrat 1985, Lebrat et al. 1987, Raharihaona 1980). The position of the suture, at the eastern edge of these terranes, was better defined by Aspden et al. (1987) and Lebrat et al (1986).

Present work describes the situation of the Ecuadorian Western Cordillera between 0° and the Colombian border.

Lithologic assemblages

Basement of terranes of the Cordillera and the Coastal Plain consist of a serie of lithologic units, with ages from Lower Cretaceous to Paleocene. Tholeiitic basalts and flysch-type sediments, ending in a conglomeratic unit, are their main components. An Eocene assemblage, consisting to the east of back-arc-type sediments and lavas, and to the west of island-arc-type volcanic deposits, with sporadic calcareous intercalations, rests unconformably on top of this basement. Locally, it is covered, also unconformably, by several continental Oligocene to recent calc-alkaline volcanic series.

Two main belts of batholiths can be distinguished among the various intrusive phases. One, of Miocene age, is located near the axis of the Western Cordillera. The second, of Eocene age, is located toward the west, almost in the coastal plain. It could be the root zone of above Eocene island arc.

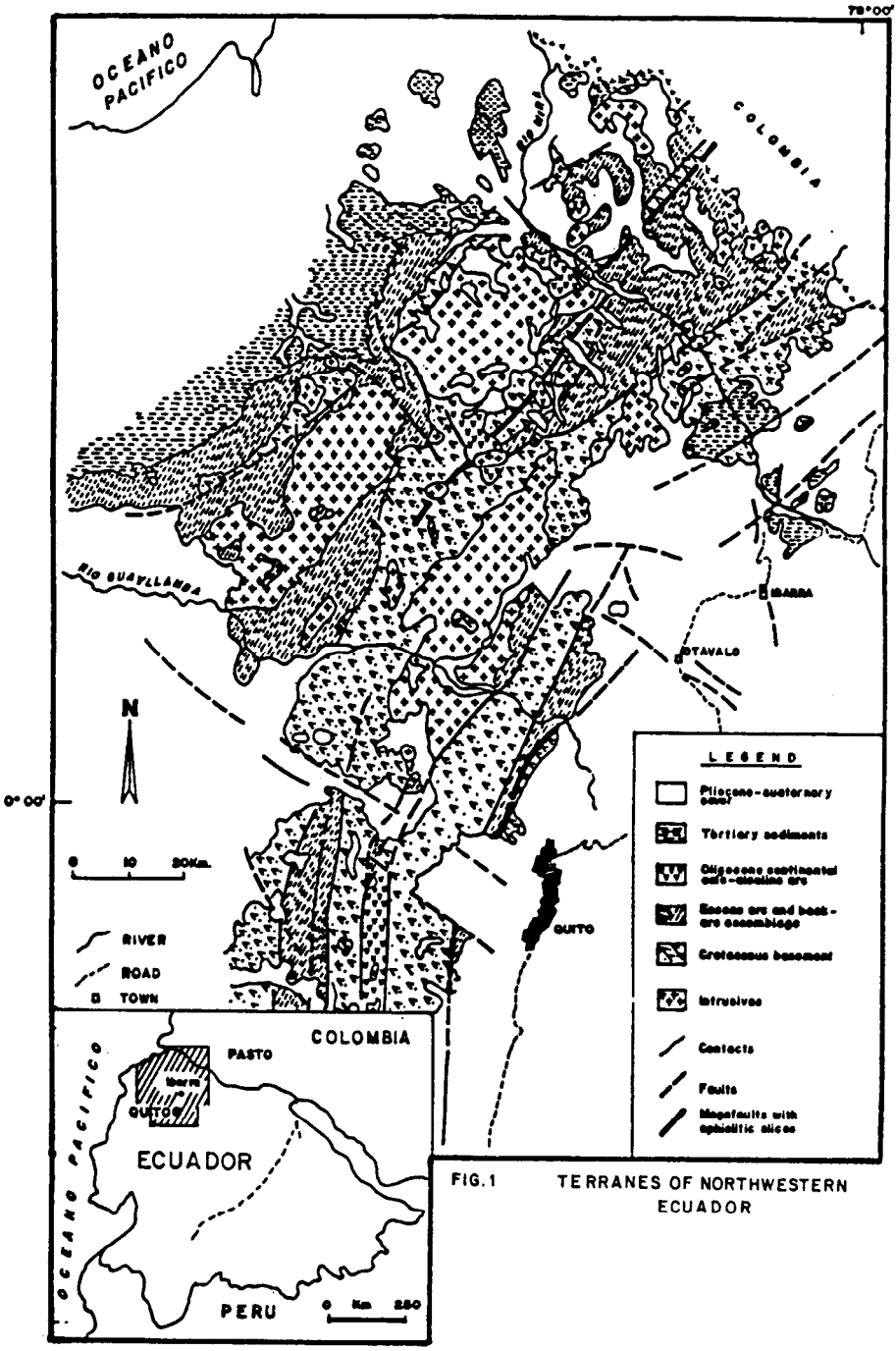

FIG. 1 TERRANES OF NORTHWESTERN ECUADOR

Tectonic events and structure

The history of this Western Cordillera is dominated by two main tectonic events, the first of Maestrichtian-Paleocene age, the second of Oligocene age.

Structurally, an intricate, east-verging asymmetric tectonism is evident mainly in the eastern part of most profiles, without presenting clear evidence of obduction. Sporadic ophiolitic rock-outcrops, delineating a suture zone near the eastern base of the Western Cordillera, are the expression of a late Cretaceous-early Tertiary accretion, without exluding the possibility of earlier accretions towards the East (Aspeden et al. 1987).

Toward the West, gabbroic and ultramafic rocks crop out along another major fault zone, possibly related to the second tectonic event of Oligocene age.

All of the Cordillera is sliced-up into longitudinal tectonic blocks through transcurrent faulting.

Metallogenic environment

The metallogenic environment is caracterized by hydrothermal (epigenetic) mineralization related to later intrusives, superimposed on top of a syngenetic context, associated with the accreted ophiolitic and island-arc-type units.

Geodynamic evolution

The Ecuadorian Western Cordillera, and the Coastal Plain can be interpreted as an oceanic fragment, accreted during the late Cretaceous-early Tertiary.

Eocene oblique subduction from the southwest built an island arc and its related environments on top of the Cretaceous basement.

This evolution was ended by an Oligocene not yet well defined compressive tectonic event, corresponding possibly to a general re-organization of Pacific subduction regimes.

After a possible westward jump, a more perpendicular subduction produced magmatic activity typical of an active continental margin.

References

Aspden, J., Litherland, M., Duque, P., Salazar, E., Bermudez, R. y Viteri, F., 1987. Un nuevo cinturon ofiolitico en la Cordillera Real, Ecuador y su posible significado regional. Politecnica, XII, 2, 81-93, Quito.

Eguez, A., 1986. Evolution Cénozoïque de la Cordillère Occidentale septentrionale d'Equateur (0° 15' S - 01° 10' S), les minéralisations associées. Th. Doc. UPMC, Paris,116p.

Hendersen, W.,G., 1979. Cretaceous to Eocene volcanic arc activity in the Andes of northern Ecuador. J. Geol. Soc. London. 136, 367-378.

Lebrat, M., 1985. Caractérisation géochimique du volcanisme anté-orogénique de l'Occident équatorien: implications géodynamiques. Documents et Travaux du Centre Géologique et Géophysique de Montpellier, 6, 118p.

Lebrat, M;, Mégard, F. et Dupuy, C., 1986 . Pre-orogenic assemblages and position of the suture between oceanic terranes and the South AmericanContinent in Ecuador. Zbl. Geol. Paläont., 1, (9-19), 1207-1214.

Lebrat, M., Mégard,F., Dupuy, C. and Dostal, J., 1987. Geochemistry and tectonic setting of pre-collision Cretaceous and Paleogene volcanic rocks of Ecuador. Geol.Soc. Am. Bull., 99,569-578.

Raharihaona, L., 1980. Pétrographie des roches volcaniques et anté-orogéniques des Andes équatoriennes: contribution à l'étude de leurs paragenèses métamorphiques.Th. Doc. Univ. Louis Pasteur, Strasbourg, 166p..