

Nature and origin of the Interandean Depression in Ecuador

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The Ecuadorian Andean mountains comprise the topographically distinct Eastern Cordillera (**EC**) and Western Cordillera (**WC**). These topographic ridges are separated by the Interandean Depression (**IAD**), which is an elongate, tectonic structure that has been active since Late Miocene, resulting in an extensive topographic depression, and the formation of isolated intermontane basins. The IAD straddles the dismembered late Cretaceous suture between allochthonous oceanic rocks exposed in the WC and continental crust in the EC. Within Ecuador, the origin and composition of the basement of the IAD is mainly unknown because of the extremely restricted extent of basement inliers within the post-oligocene volcanic cover.

This contribution aims at to clarify the nature and the age of the basement of the IAD and to construct an accurate post-Late Miocene tectonic history of the IAD structure, based on field observation and radiometric ages of syn-tectonic sedimentary rocks.

BACKGROUND INFORMATION

The crystalline Cretaceous basement of the WC partly comprises the late Cretaceous oceanic plateau basalts (Pallatanga Terrane), in tectonic contact with a late Cretaceous tholeiitic island arc sequence (Rio Cala Arc). These units accreted against the continental margin during the late Cretaceous (Jailard et al. 2004). The suture is partly represented by the Calacali-Pallatanga Fault (**CPF**), located at the western border of the IAD. Metamorphosed continental rocks comprise the Eastern Cordillera (EC), which is juxtaposed against the IAD via the Peltetec Fault (**PF**). Undated, anastomosed fault slivers of crystalline mafic rocks crop-out along the PF.

We performed geochemical and isotopic analyses of various mafic-ultramafic rocks that comprise the basement of the IAD within the depression itself and

along its bounding faults (Pallatanga, Rio Cala and Peltetec Units). We are also performed (in progress) several $^{40}\text{Ar}/^{39}\text{Ar}$ ages of stratified volcanic tuffs within the sedimentary sequence resident into the IAD which record the tectonic activity of the Ecuadorian Andes.

RESULTS 1: Mafic basement

IAD basement - north is geochemically similar to the Rio Cala arc lavas.

- High LILE/HFSE ratios
- Negative Nb-Ta anomaly
- LREE enriched : $(\text{La}/\text{Yb})_n=6.08$.

IAD basement - south is geochemically similar to the Pallatanga Unit.

- enriched in LILE and HFSE with respect to P-Mantle.
- flat REE patterns: $(\text{La}/\text{Yb})_n=0.9$.

Mafic rocks of the Peltetec Unit yield similar trace and REE trends to basalts of the Pallatanga Unit.

- slightly enriched LREE: $1.3 < (\text{La}/\text{Yb})_n < 1.8$.
- moderately enriched in LREE
 $(2.4 < (\text{La}/\text{Yb})_n < 2.7)$.

Our analyses show broad similarities between the original tectonic setting of the basement of the IAD with mafic rocks from WC. This suggests that may be are an extension of accreted plateau and island arc oceanic fragments currently exposed in the WC. The same late Cretaceous basement units may also extend into the EC, rendering it difficult to infer the presence of an allochthonous early Cretaceous terrane beneath the IAD, as proposed by Litherland et al., (1994).

RESULT 2: Post-Late Miocene history of the IAD

Radiometric analyses of basal volcanic deposits show that the Intermontane basins hosted into the IAD young from 6 Ma in the north to 3 Ma in the southern IAD (Winkler et al, 2005). Prior to 5.5 Ma, there was no IAD, implying that one cordillera existed in Ecuador. The basement of the IAD probably shares the same origin as that exposed in the WC, although it has since been segmented by fault activity. The complicated and dense fault array within the IAD and its basement has resulted in a segmented morphology and has controlled the sites of volcanic emplacement.

CONCLUSIONS

- The basement of the IAD is probably an extension of late Cretaceous accreted oceanic rocks exposed in the WC.
- The undated Peltetec Unit shows broad similarities with late Cretaceous accreted mafic rocks that are currently exposed in the WC.
- The believed suture zones must be reconsidered, some of them probably young feature related to the opening of the IAD.
- The IAD began to open at c.a. 6-5 Ma in northern Ecuador and propagated southward. Syn-sedimentary deformation prevailed during most of the life-span of the IAD.

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