

Microstructures, deformation styles and tectonic history of the Cordillera Real of southern Ecuador

F. Guarderas¹, C. Herrera¹, A. Egüez²

¹Sección de Geodinámica, Minería y Metalurgia, Universidad Técnica Particular de Loja. Loja

²Departamento de Geología. Escuela Politécnica Nacional (EPN). Quito, Ecuador

The Cordillera Real of southern Ecuador includes metamorphic rocks of Paleozoic and Triassic age, located between the Baños - Las Aradas fault to the west and Palanda fault to the east (1). The Paleozoic rocks are mainly represented by the Chiguinda unit consisting of black phyllites and quartzites that outcrop as a broad belt of several tens of kilometers wide. Towards the east, outcrops a belt of the Triassic Sabanilla unit, consisting of biotite gneisses and migmatites. The deformation and the degree of metamorphism are strongly contrasted between both assemblages.

The analysis of microstructures in the metapellites of Chiguinda shows three remarkable deformation phases. The first one is revealed with transposition foliations with high angle involving similar folds produced by flattening and shearing that also develops en echelón folds. This deformation is affected and obscured by a second phase dominated by duplex and thrust structures that are observed mainly in the middle topographic levels of the cordillera. The faults of the duplex have Andean direction and they have preferred vergence to the east. The third phase is observed in the high lands of cordillera and manifests itself with regional thrusts along equally Andean trending faults. This thrusting is related to subhorizontal cleavages and micro-folds lying down and accompanied by sigmoidal sheared structures, all with a dominant vergence to the west.

In the Sabanilla unit, the deformation is much more intense and as expected in migmatitic rocks, is dominated by chaotic plastic flow structures.

To establish the tectonic history we consider the thermochronological information recognized in the southern part of the Cordillera (2), where the last events are dated of around 40 Ma, contrary to what is observed in the northern part where more younger important events are reported in the Neogene. It is proposed that the first deformation corresponds to the Peltetec event occurred 120-130 Ma ago, the second phase would be related to the accretion of the oceanic terrains of Western Cordillera 70 Ma ago and the third phase would be related to the Andean uplift of 40 Ma (Late Eocene), attributed to the accretion of the insular arc Macuchi. Based on the referred thermochronological data, the significant exhumation of the migmatites of Sabanilla would be related to this last event.

(1) Litherland et al. (1994). British Geological Survey, Overseas Memoir 11. IIGE. Quito.

(2) Spikings et al. (2010). Journal of South American Earth Sciences (2010), doi: 10.1016/j.jsames.2010.04.002.