TECTONIC MODEL OF THRUSTS AND IMBRICATED THRUSTING WEDGE ON THE NORTHWESTERN FLANK OF THE MERIDA ANDES BETWEEN TORONDOY AND VALERA (VENEZUELA)

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A new model to explain the tectonic evolution and present structural configuration of the North-Andean Flanck (Torondoy-Caja Seca-Valera; Figure 1) is presented. The deformation style is based on the geometry of flexure folds applied to thrusting areas. The geometry is formed by ramps and flats associate to fault-bend folds (Suppe; 1983), wich evolve into fault-folds (Figure 2 and Figure 3).

In the study area, this deformation is the cause of complex imbricated thrusting and intercutaneus thrusting wedge system, which are consequence of distinct tectonic events. These events have affected the Andean Flank since the Oligocene-Miocene period until recent Pleistocene. The Virtudes Thrust (Figure 2) is the main expression of this system.

The system has developped in two phases: the first event (Figure 3-1 to 3-3), Pre-Pliocene in age, is developped over a ramp 3-4 km long dipping about 30-35 to the south-east, towards the Boconó Fault. A second event, Plio-Pleistocene in age, with a ramp of 3-4 km and dipping 55-60 to the south-east is formed on the upper flat of the first ramp (Figure 3-4).

Andean basement rocks have been overthrusted up to 34-36 km into the Maracaibo Basin. It is the cause of the Cretaceous and Tertiary rocks decollements over the fault-bend fold. The decollements of the Meso-Cenozoic cover are situated within the shaly units of the Upper Cretaceous Formations (Luna-Colon) and also within the Mio-Plio-Pleistocene Betijoque Formation.

This complex thrusting is associated (Figure 2) with strike slip faults, dextral (Piñango Fault) in the south or senestral (Rio Momboy and Rio Motatan Faults) in the east.

In agreement with Hospers and Van Wijnen (1959), Kellogg and Bonini (1982, 1985), Giegengack (1984), Kohn *et al.* (1984) and De Toni and Kellogg (1993), this work, based on remote sensing studies, field observations and cross-section modelizations, suggests that the Venezualan Andes uplift is caused by crustal shortening along two generations of complex southeast dipping thrust faults.

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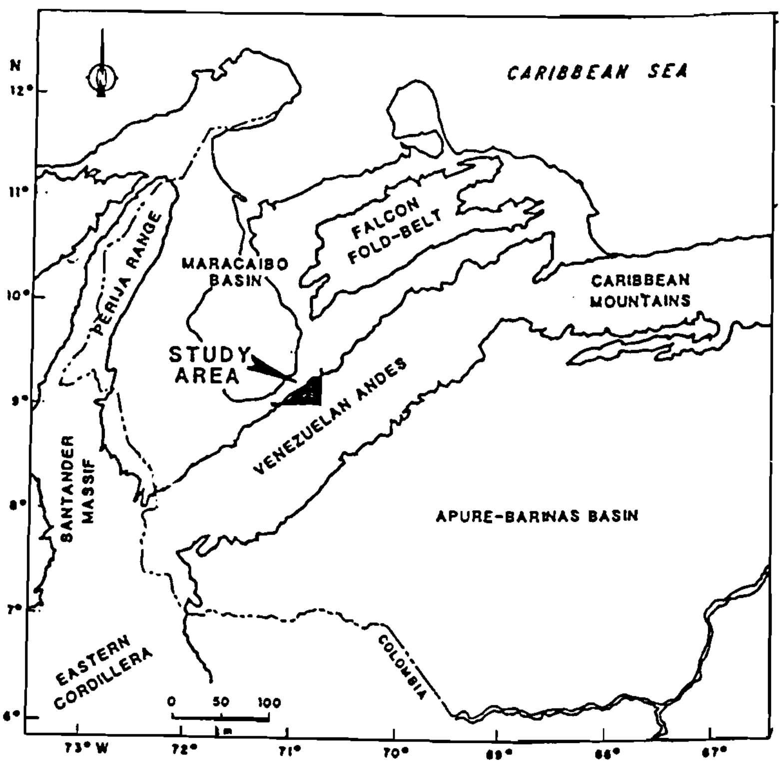

Figure 1: Location map of the study area (slightly modified from De Toni and Kellogg, 1993).

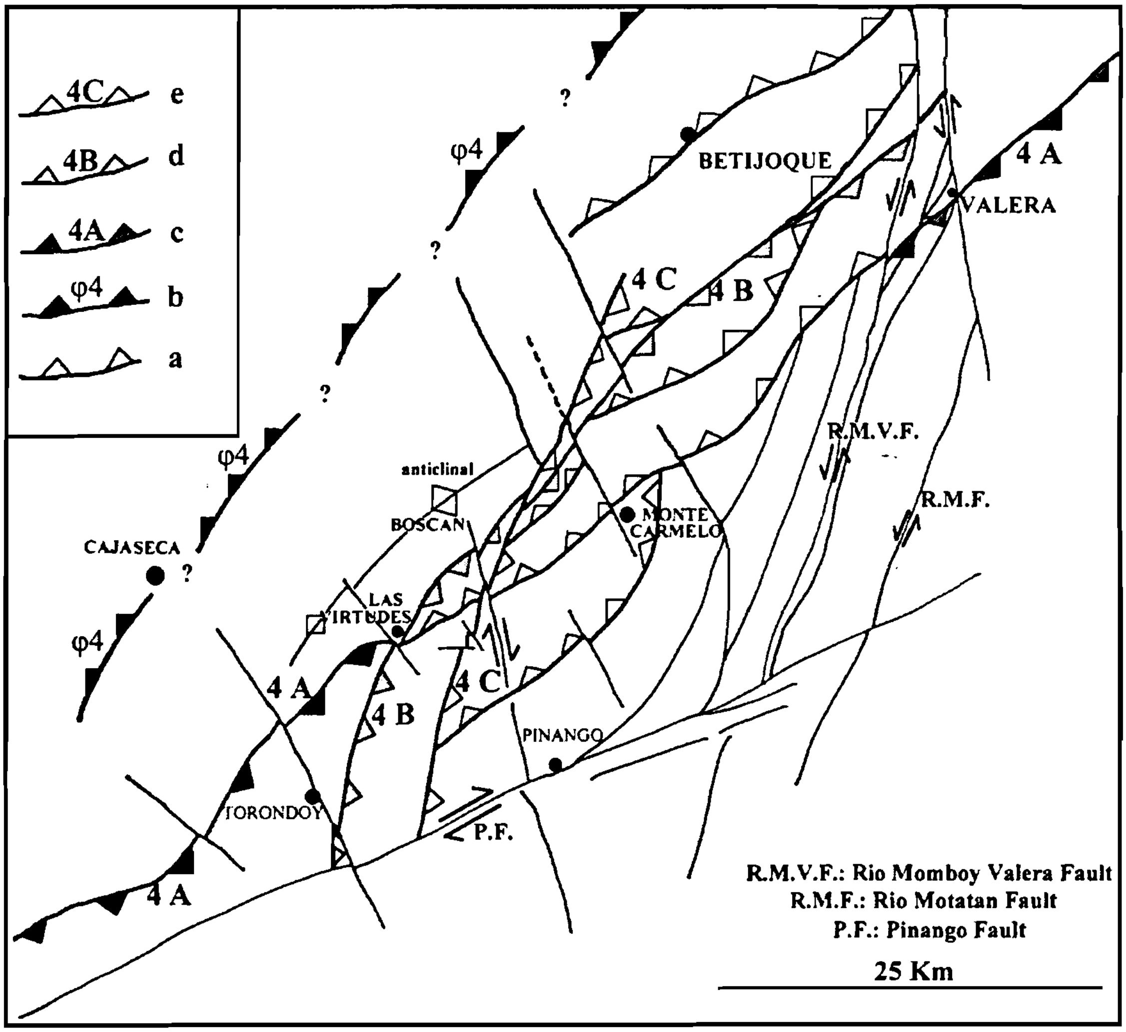

Figure 2: Structural analysis using remote sensing data (Landsat TM path 006-row 054) and landscape observations.

a: Pre-Pliocene back thrusts (figures 3-1 to 3-3); b: Plio-Pleistocene back thrust (figure 3-4); c, d & e: Synthetic thrusts, Plio-Pleistocene in age (not modelled on figure 3); c: Las Virtudes thrust (Plio-Pleistocene); d: Ancient Pleistocene thrust; e: Recent Pleistocene thrust and back thrust.

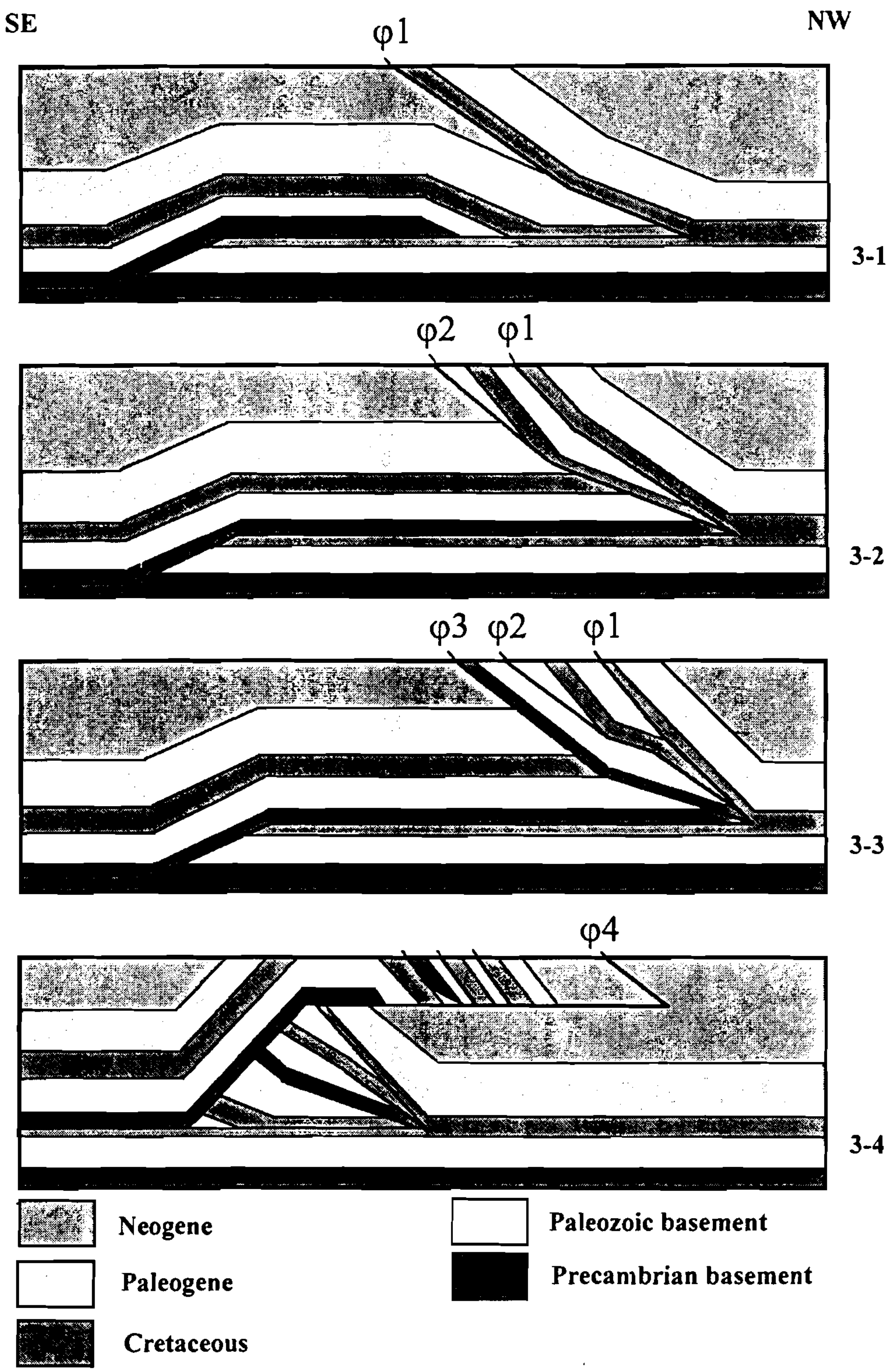

Figure 3: Modelled cross-sections of the Northwestern flank of the Venezuelan Andes using program "Thrust" (Charlesworth and Jahans, 1992).

3-1 to 3-3: Pre-Pliocene events; 3-4: Plio-Pleistocene event.