INTERNATIONAL SYMPOSIUM ON GLOBAL CHANGES
IN SOUTH AMERICA DURING THE QUATERNARY:
PAST - PRESENT - FUTURE

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NEOTECTONIC OF THE PERUVIAN JUNGLE AS RELATED TO GEOMORPHOLOGY AND FLUVIAL DYNAMICS

JEAN FRANÇOIS DUMONT
ORSTOM - Apartado 18-1209, Lima, PERU

Geographic aspects as geomorphology, fluvial dynamics, and upland/wetland distributions provide various opportunities to estimate the neotectonic evoluion of the Peruvian jungle.

Two morphostructural units constitute the Amazonian region of Peru (fig. 1). Each of them corresponds to a distinct morphology, though the altitude is similar, below 500 m above sea level in both cases. One, which lies on the central and southern regions of Peru depends on the Andean tectonics: the morphology is broken. It comprises the upper Ucayali (upstream from Contamana) and the Madre de Dios river basins. During the late Tertiary these regions have been uplifted and eroded contemporaneously to the tectonic rise of the Andes (Benjamin et al.,1987). The other region which cover the northern part of eastern Peru depends on the Guianian-Brazilian craton tectonics: the morphology is smooth-line. It concerns the Marañon basin where the Marañon, Pastaza, Tigre and Ucayali rivers merge. This basin is by far the widest and drains all the eastern Andean slopes between the 1st and 13th degrees South latitude.

The Tapiche thrust fault, constitutes the boundary between the two morphostructural units (fig. 1). It runs along the north-eastern edege of the Contaya Arch, a sub-Andean structural unit uplifted during the late Tertiary/early Quaternary along previously existing faults, and marked by the occurrence of hyperalcaline Mio-Pliocene magmatism (Stewart, 1971). North-westward the Tapiche fault turn toward the sub-Andean thrust and fold belt (Mégard,1984) and probably joins it.

Uplifted areas under the Andean tectonics

The evenness of eastern Andean foothill morphology is broken, as a result of the Eocene tectonic phase, and transformed into an Apalachian relief with up to 1000 m between the valley bottom and the hill tops (Dumont & Arana,

1987). The filling of the valleys is contemporaneous with the fluvial deposits found at the upper Tertiary series of the Ucayali and Madre de Dios regions (Frailey,1986). During the latter Miocene or early Pliocene periods, sub-Andean terrains were strongly deformed. Miocene layers were tilted (Atalaya region) or folded (Urubamba and Manu regions). Folding tectonics have produced a general uplifting and a correlative entrenchment of rivers as a result. The Urubamba river runs South to North according to fossil stream directions observed in the late Miocene terrains, and cuts across the upper Tertiary Camisea folded structures, as well as across a vast bulged Quaternary terrace, northward, near Shepahua. Minor rivers drain the Camisea folded structures flowing westward (Urubamba tributaries: Camisea, Shepahua, Mishagua), and estwards (Madre de Dios tributaries: Manu, Los Amigos, Pariamanu, Las Piedras). During the Pliocene period valleys were scoured in these upper Tertiary layers, up to 200m in depth. In the Sepahua region, they were partially filled-in with fluvial deposits during the lower Pleistocene. Quaternary conglomerates were deposited in successive terraces, the upper one rises up to 60 m above the present level of the river beds. Near Atalaya the floodplain 5 to 10 km wide, is bound by the sub-Andean foothills westward and by the western edge of the Contaya Arch eastward. The latter was uplifted during late Tertiary/early Quaternary tectonics, and bordered by a deeply altered high terrace (30 m). C14 dating of two lower terraces (13850 +480/-360 BP; 8520 +440/-420 BP), separated from the floodplain by a lineament type border, show that the entrenchment occurred in the late Pleistocene/early Holocene, respectively.

Subsiding areas under cratonic tectonics

The vast Marañon sedimentary basin lies between the Andean foothills uplifted along the sub-Andean thrust and fold belt (Mégard,1984), westward, and the positively epeirogenic Guianian-Brazilian craton eastward, represented in Peru by the Iquitos geanticline. The Marañon basin has subsided as shown by the thickness of sediment deposits - 5000 m since the Jurassic - of which 1300 have been deposited since the upper Tertiary. The area of principal subsidence in the center of the basin corresponds to a large wetland (about 25000 km^2) inundated by rainfall, and by rivers at the time of the highest floodings. A negative epeirogenesis in relation to Andean tectonic and uplifting has affected the Iquitos geanticline during the Tertiary as shown by a 500-600m thick sediment deposit (Soto,1979). Epeirogenesis has been positive again

during the Quaternary and has constrained main rivers to converge toward a single exurgence (Amazon valley). Currently, upper Tertiary/lower Quaternary terrains of the Iquitos geanticline upland are 30m higher than the Marañon basin wetlands which are subsiding. The western limit of the Iquitos geanticline (NNW-SSE) is parallel to and superposed upon an important network of faults in the basement (Laurent,1985). The Ucayali river flows into the Marañon inside a depression encased between two uplifted blocks respectively, located northward (Nauta) and southward (Jenaro Herrera). Both blocks belong to the Iquitos geanticline. Crossing the geanticline, the Marañon and the Ucayali rivers follow northern and southern uplifted blocks. Straight segments of the mean channel suggest the occurrence of faults. Meandering is dissimetric with a single channel outward and several channels inward toward the depression. Such a pattern may result from Quaternary distensional tectonics. Both rivers keep flowing along the normal faults which limit the two uplifted blocks as a result. Those faulting tectonics are corroborated by the occurrence of normal faults in the upper Tertiary/early Quaternary terrains (Dumont et al.,1988). North of Jenaro Herrera, two intermediate terraces limited by fault lines lie between the uplands and the Ucayali floodplain. C14 dating of these terraces (32750 +3520/-2440 BP and over 40000 BP, the higher and 13000 +2090/-1660 BP the lower) show that the encasing of the Amazon occurred during the Pleistocene.

Effects of faulting, folding and tilting tectonics on fluvial dynamics

The analysis of effects caused by faulting, folding and tilting tectonics on the two western Amazonian morphostructural units clearly indicate that areas affected by fluvial dynamics are limited within well defined depressions, the tendency of which is subsiding or encasing. Folding and tilting tectonics, which lead to river encasings, and faulting tectonics which canalize rivers, all contribute to limit river lateral migration more than to extend them. Faulting tectonics are considered to be less important than folding and tilting tectonics in Peruvian Amazon. In subsiding areas such as the Marañon basin, these faulting tectonics play a major role on limiting wetlands and uplands, as it has been pointed out for the Amazon basin in Brazil by Sternberg (1950), as well as making irregular meandering patterns (Sternberg, 1957, Tricart,1977).

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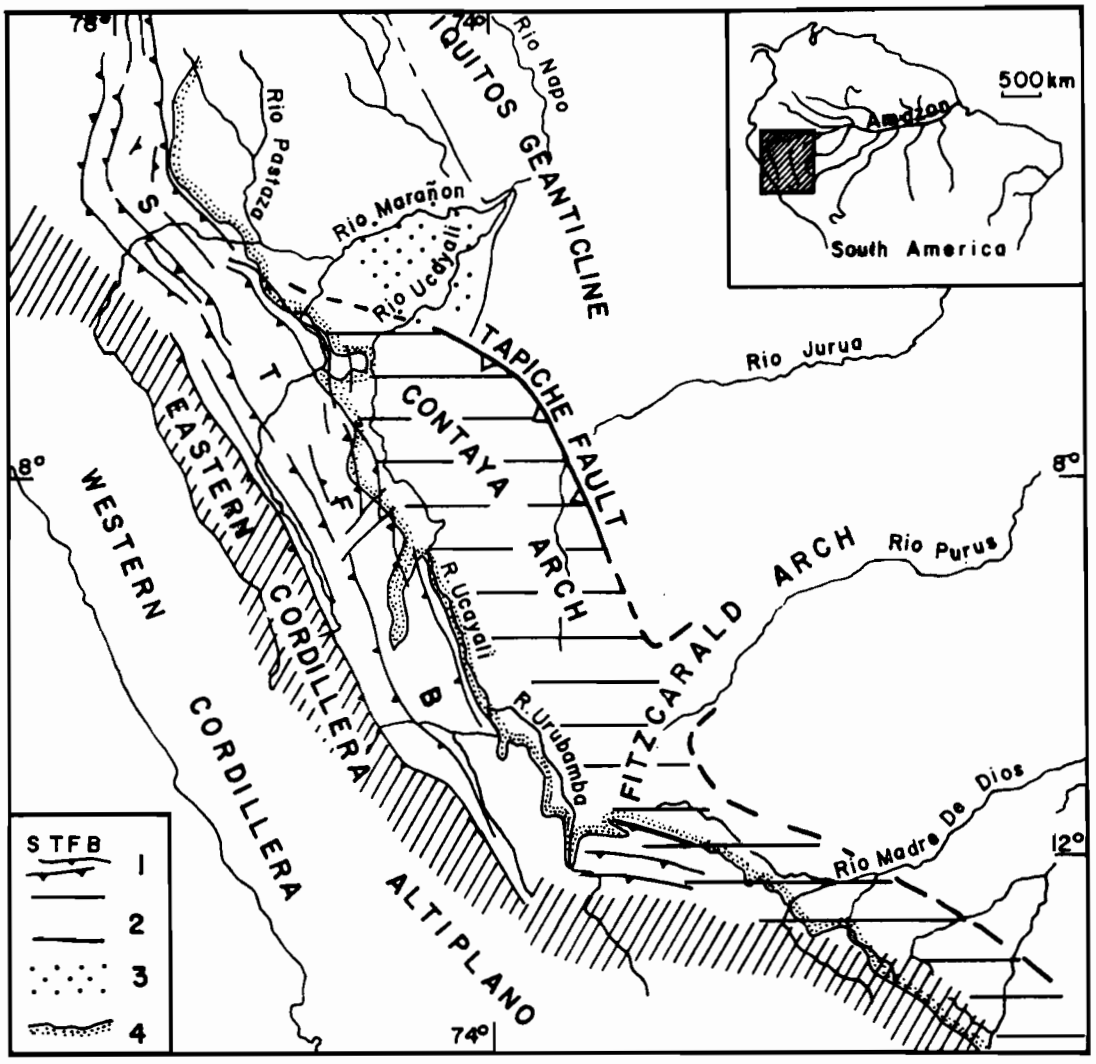

Fig. 1 - Morphostructural scheme of eastern Peru. 1: Sub-Andean thrust and fold belt (STFB). 2: Areas uplifted since the upper Tertiary/early Quaternary. 3: Major subsiding area of Marañon basin. 4: 500m altitude limit.

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