

It seems clear that only one extreme rainfall event, with highly cumulated antecedent rain (previous 6-months) led to extreme geomorphic responses, as it has interacted with a disturbed environment due to human induced geocological changes. Erosion-sedimentation rates attained a catastrophic magnitude, not only for its physical dimension, but also for affecting the sustainability of the geo-biodiversity and causing serious socio-economic damages with irreversible human losses. Nowadays erosion susceptibility increased as landslides-clearing sites spread over the steep slopes and border effects again promote forest deterioration. In ten years the forest vegetation will not be fully recovered in their functional aspects that regulate both hydrological and mechanical soil properties, as shown by recent works in the Tijuca massif (Rocha Leão & alii, 1996; Cruz & alii 1998).

Catastrophic geomorphic responses were detected at different time scales: a) for individual rainfall events over disturbed geocossystems at the mountain-forest-megacity interfaces; b) for long-term rainfall periods (hundred years) over extensive disturbed geocossystems at the forest-coffee-cattle grazing interfaces and c) for recent geological times (Pleistocene-Holocene transition) over climatic induced transitory geocossystems. What do they have in common? Two major aspects: 1) climatic fluctuations toward warmer conditions, leading to an increasing frequency of intense rainfalls and 2) Forest disturbances ranging from subtle decreasing of tree species (naturally or artificially) to complete removal. In what aspects the studied geocossystems differ? Basically in their internal rules governing groundwater flows and their implications with hillslope erosion, particularly at basin scale. So, many questions still remain open to guide future investigations. The more we learn by field investigations, more we realize all aspects that yet remain to be known and understood, at least in the complex geomorphic systems found in SE Brazil.

**ABSTRACT:** COELHO NETTO A.L., *Catastrophic landscape evolution in humid environments: inheritances from tectonic, climatic and human induced changes in SE Brazil.* (IT ISSN 0391-9838, 1999).

Humid environments comprise landscapes under permanent river-flow regimes, including areas with distinct geo-biophysical and sociocultural conditions as a product of their respective geological, climatic and human histories. Over time, environmental changes of a certain order of magnitude may shift the direction of landscape evolution leaving behind degradation/aggradation cycles, sometimes at very intense rates or catastrophically. Therefore humid landscapes are expected to preserve at least some relict features from these cycles, specially on the hillslope morphology and stratigraphical records providing partial arguments for the reconstruction of landscape evolution over space and time. In this lecture I will address questions about the role played by such inherited geological-geomorphological features in controlling present-day processes that govern landscape evolution. Special attention will be driven toward the geomorphic responses to antropogenic environmental changes within an ecosystemic approach.

Field arguments derive from researches conducted in SE Brazil, specially in the Paraíba do Sul river valley. Following the pleistocene savanna-like environment, this region was dominated by the tropical rainforest (called Mata Atlântica) throughout the Holocene despite minor climatic fluctuations toward to relative drier climatic conditions. Deforestation started in the mid-XVIII century when coffee plantations spread all over the region and remained until the end of the XIX century; then the region was dominated by cattle grazing. As pointed out in the previous

work conducted by Meis and her collaborators, based on detailed morpho-stratigraphic records, hillslope evolution followed a highly discontinuous evolutionary pattern: denudation was concentrated within the so-called rampa complexes (topographic hollows) being submitted to successive episodes of high erosion-depositional rates in response to paleo-hydrological changes (Meis & Monteiro, 1979; Meis & Moura, 1984; etc.). In the last 20 years we have integrated morphological, stratigraphic and process studies arguments to support Meis's theory and bring into view a mechanistic explanation of landscape evolution within an ecosystemic approach. Emphasis has been given to a better understanding on erosion mechanisms and variable controls, focusing the geomorphic responses to recent environmental changes. Despite a complex geomorphic history of such Dunnean-Hortonian landscape, present-day processes reproduce the same mechanisms and routes from recent geological times (Late Quaternary at least); the evolutionary pattern have coupled episodicity and synchronization at both hillslope and fluvial degradation-aggradation cycles under high rates; the spatially non-uniform hillslope evolution is strongly controlled by the underlying litho-structures (fractured, well-banded gneisses & granitoid rocks) derived from ancient times; the regional denudation is therefore governed by local slope retreat and relief inversions due to the destruction of watershed divides; therefore the remnants of older erosion surfaces are gentle inclined as the density of local process dynamic increases from the mountain compartment toward to the hilly lowlands and to the main regional collector, the Paraíba do Sul river.

#### REFERENCES

- ABSYS M.L., CLEEF, A., FOURNIER M., MARTIN L., SERVANT M, SIFEDDINE A., FERREIRA DA SILVA M., SOUBIES F., SUGUIO K., TURCO B. & VAN DER HAMMENT T. (1991) - *Mise en évidence de quatre phases d'ouverture de la forêt dense dans le sud-est de l'Amazonie au cours des 60.000 dernières années.* Comptes Rendus Ac. Sc., Paris, 312., Ser. II, 673-678.
- ALMEIDA J.C.H, EIRADO SILVA L.G. & AVELAR A.S. (1991) - *Coluna tectono-estratigráfica de parte do complexo Paraíba do Sul, na região de Bananal/SP.* Simp. de Geologia do Sudeste, 2, São Paulo, Anais, SGB, 509-5127.
- ALMEIDA J.C.H., SILVA L.G.E. & VALLADARES C.S. (1993) - *O Grupo Paraíba do Sul e as rochas granitóides na região de Bananal (SP) e Rio Claro (RJ): uma proposta de formalização lito-estratigráfica.* In: Simpósio de Geologia do Sudeste, 3, Rio de Janeiro, Atas SGB, 155-160.
- AVELAR A.S. & COELHO NETTO A.L. (1992a) - *Faturas e desenvolvimento de unidades geomorfológicas côncavas no médio vale do rio Paraíba do Sul.* Rev. Brasil. Geociências, 22(2).
- AVELAR A.S. & COELHO NETTO A.L. (1992b) - *Fluxos d'água subsuperficiais associados a origem das formas côncavas do relevo.* Anais da 1a. Conferência Brasileira de Estabilidade de Encostas / COBRAE, ABMS e SBGE, Rio de Janeiro, vol. 2, 709-719.
- AVELAR A.S. & LACERDA W.A (1997) - *Mass movement caused by rock block impact at the Soberbo slope, Rio de Janeiro, Brazil.* IV Intern. Conf. on Geomorphology, Bologna, Itália, Suppl. Geogr. Fis. Dinam. Quat., v. 3, t. 1, 60.
- BIGARELLA J.J., MOUSINHO M.R. & SILVA J.X. (1965) - *Considerações a respeito da evolução das vertentes.* Bol. Paranaense Geogr., 16/17, 85-116.
- BRANDÃO A.M.P.M. (1992) - *Variações climáticas na área metropolitana do Rio de Janeiro: uma provável influência do crescimento urbano.* Sociedade e Natureza no Rio de Janeiro, Editora Carioca, 143-200.
- CAMBRA M.F.E.S. & COELHO NETTO A.L. (1998) - *Propriedades físicas do solo e densidade de raízes: variáveis-controle no processo de infiltração vertical do solo em Áreas de Pastagem: Bananal (SP).* II Simpósio Nacional de Geomorfologia, v. 14, 27, 394-399; Florianópolis/SC.
- CAMBRA M.F.E.S. (1998) - *Fluxos d'água subterrâneos no controle de voçorocas conectadas à rede regional de canais: Estação Experimental Fazenda Bela Vista, Bananal, SP.* Tese de Mestrado, PPG em Geografia/ UFRJ.