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Erosion and mass movements in saprolitic soils of Madagascar

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Madagascar is among the tropical countries which are intensely affected by the presence of thick saprolite deposits, deriving from development of deep weathering process in the crystalline parent rocks. Frequency of weathered, highly prone to erosion, terrains is also at the origin of the widespread tendency toward desertification of large regions in the country. Desertification is, in turn, favoured by the "tavy" practice, that is the man-made fires used for development of grassland areas devoted to pasture. Central Madagascar, with particular emphasis on the central highplain, north of the town of Antananarivo, is severely interested by these processes. Development of erosional processes is mainly highlighted by the diffuse presence of "lavaka" (a Malagasy word meaning literally "long holes"): they are very long and deep ravines produced by linear erosion on bare slopes, and which may locally evolve to mass movements (slide, slide-debris flow). "Lavakas" are often concentrated in hollows or zero-order basins, where colluvial and residual deposits may concentrate. Their geometry may be extremely variable, from simple shape to multiple coalescing "lavakas" which create wide areas affected by erosion with a dendritic pattern. These deep gullies seem to be strictly related to the structural setting of the parent rocks, and the strike of the main morphological units, whilst their initiation may be locally related to anthropogenic activity on the slopes. An important communication route (RN4), connecting Antananarivo to Mahajanga, is undermined at several sites by the development of such features. The present contribution intends, through description of the erosional landforms identified in a sample area of the highplain, discuss the genesis of "lavakas", and their influence with the anthropogenic environment (undermining roads and bridges,

triggering flow-like mass movements which deposits invade agricultural lands).