



Temporal dynamics of soil erosion and rainfall erosivity as geoindicators of land degradation in Northwestern Argentina

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Abstract

The subtropical region of Northwestern Argentina displays severe environmental deterioration due to a combination of factors, including seasonally contrasting weather, highly erodible loessic soils, a topography with varied slopes, and natural vegetation coverage restricted by deforestation and agricultural advance, in addition to exploitation of natural resources by people. The aim of the present research was to determine the landscape degradation, using as geoindicators the increase in erosion by water and the pluviometric gradient variations through time.

Two regions were chosen as sample areas in the province of Tucumán: the eastern foothills and plain of the Southeastern Ranges (Western Chaco); and the intermountain valley of Tafi. Erosion increase was quantified by measuring the length of gullies and ravines; and the sedimentation in the artificial lake (La Angostura) located in the center of the valley of Tafi. Climate changes were analyzed by means of the rainfall erosivity variations in both sample areas during the last 30 years.

The lineal increase in erosion is closely related to the pluvial dynamics. Nevertheless, this erosive intensification is also dependent on the interaction of environmental factors and human activities (deforestation, land use changes, unrestricted agriculture).

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1. Introduction

Landscape degradation is dramatic in Northwestern Argentina. The mapping of the temporal and spatial evolution of hydric erosion processes constitutes a geoindicator of ground deterioration. Rainfall is the fundamental cause of hydric erosion, which is sped up or attenuated by climatic changes. Nevertheless, rainfall fluctuations are not the only critical cause of degradation. Uncontrolled urbanization and the lack of land management, combined with environmental fragility, worsen the situation.

Previous studies of the impact of increasing urbanization, agriculture and erosion in Tafi del Valle (Neder et al., 1998) show an accelerated degradation of the landscape in

the last 30 years, which is a consequence of the rainfall fluctuations of the region. In the western Chaco, there was a similar situation due to the agricultural advance by deforestation, favored by increased rainfall and good market prices during the 1970s which increased the land deterioration by means of intensified hydric erosion (Busnelli, 2003). The objective of the present research is to evaluate the landscape degradation through the erosive increase, the pluvial variations, the land use changes, and the land management of two contrasted regions, which are representative of the environmental conditions of northwestern Argentina.

2. Methodology

In the first stage, the available data, remote sensed material and bibliography related to the study areas, were collected and compiled. The cartography of gully and ravine erosion was obtained through multi-temporal photointerpretation on reduced sectors in both sample areas. The analyzed aerial photographs correspond to the

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