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Long-term hydro-sedimentary monitoring and modelling for the conservationist planning of the soil and water in a small catchment in southern Brazil.

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The hydrological dynamics of a small rural river catchment in southern Brazil have been used to understand the impact of agricultural activity on soil and water resource degradation. The monitoring and modeling strategies employed to better understand the integrated phenomena focus on surface flow dynamics and the associated processes, such as erosion, sediment yield (SY), and chemical element transfer. In this context, monitoring and modeling techniques are combined in order to include the main hydrological processes involved in soil and water resource degradation. The project began in 2002 and over 500 rainfall-runoff-sediment events and suspended sediment concentration make up the hydrological database under different land use and soil management conditions. The 1.2 km² catchment of the study is characterized by the presence of shallow soils, high slope, intense agricultural activity, and high SY (~150 t.km⁻².y⁻¹). Techniques that enable the identification of the origin and redistribution of sediments (e.g. fingerprinting approach and Cs137) and hydrograph analysis are being used to further understand the dynamics of SY in the catchment. The comprehension of the factors involved in the SY dynamics has allowed the improvement and application of different mathematical models (e.g., LISEM and WATERSHED) to simulate surface flow and SY. These models are used to represent the influence of soil and water conservation practices while considering the interaction between the different landscape components (crops, roads, drainage network, etc.). From this set of data and tools, the capacity of the agricultural production system, drainage network, wetlands and riparian forests in accelerating or retarding water flow, sediment, and chemical elements in the landscape are evaluated. All of these studies have been used to improve soil and water conservation practices at catchment scale, meeting the expectations of farmers in erosion control and water storage as well as of the society interested in maintaining the hydrological functions of soils in catchment scale.