18th Biennial Conference of the Euromediterranean Network of Experimental and Representative Basins (ERB 2022), Portoferraio, Elba Island (Italy), 07-10 June 2022

Learning and contributing to hydrological knowledge: a 34-year journey within research basins.

Francesc Gallart

Surface Hydrology and Erosion group - Freshwater Ecology, Hydrology and Management lab. Institute of Environmental Assessment and Water Research (IDAEA), Geosciences Department, CSIC, Barcelona, Spain.

Abstract

I obtained my degree on Geological Sciences in 1974 and my Ph.D. about detailed Geomorphological Mapping in 1980. After my doctorate my interest turned to the study of erosion processes, particularly in badlands, using field observations and low-cost equipment.

It was in 1988 when we obtained two projects for establishing a network of small research basins, funded by the late ICONA (Spanish Government) as a contribution to the UNCCD (United Nations Convention to Combat Desertification). The main purpose was land conservation rather than hydrology. Two areas were selected near Vallcebre, in the headwaters of the Llobregat River: the Cal Rodó basin, selected to study the behaviour of badland areas and supervised by Núria Clotet, and a smaller Cal Parisa basin, I selected to analyse the behaviour of abandoned terraced agricultural fields. Sadly, Núria Clotet suffered a fatal car accident in 1990 and I was appealed to manage the entire network.

Since these early times, we succeeded to renew research questions and obtain funding from diverse sources, so we continued our activity developing a long series of research projects and Ph.D. studies, even if we have no permanent sources for continuing observations. Some of the subjects that we early learned have conducted our research thereafter: i) even in a Mediterranean environment, soil saturation is more important than rainfall excess in runoff generation, ii) agricultural terraces modify the spatial pattern of soil saturation areas, iii) soils are habitually drier under forest cover than under grass, iv) badland activity is the result of an annual cycle that turns from frost weathering in winter, regolith erosion in summer to sediment exportation in autumn, and v) the main environmental consequence of mountain land abandonment is the decrease of water resources due to increased evapotranspiration by the spontaneous encroachment of tree cover.

From my experience, there are two main aspects that are in the core of the ERB basins that make them necessary for the development of hydrological sciences: Hydrological models rarely give the good answers for the right reasons; internal “orthogonal” observations allow us to discern if the model adequately simulates the hydrological processes and may provide ways to improve the imitation. Particularly in small catchments and Mediterranean environments, short periods of high flow may convey the main part of sediments, solutes or environmental tracers; intensive sampling during these periods may help to identify sampling biases obtained by regular, operational samplings made in network basins.

Keywords: Runoff generation, badlands, eco-hydrology, land abandonment, model development.