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A laboratory rainfall simulator to study the soil erosion and runoff water

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The soil erosion and the runoff water composition in some areas affected by forest fires or submitted to intensive agriculture are an important factor to keep an account, particularly in sensitive areas like estuary and rias that have a high importance in the socioeconomic development of some regions. An understanding of runoff production indicates the processes by which pollutants reach streams and also indicates the management techniques that might be uses to minimize the discharge of these materials into surface waters.

One of the most methodology implemented in the soil erosion studies is a rainfall simulation. This method can reproduce the natural soil degradation processes in field or laboratory experiences. With the aim of improve the rainfall-runoff generation, a laboratory rainfall simulator which incorporates a fan-like intermittent water jet system for rainfall generation were modified. The major change made to the rainfall simulator consist in a system to coupling stainless steel boxes, whose dimensions are 12 x 20 x 45 centimeters, and it allows to place soil samples under the rainfall simulator. Previously these boxes were used to take soil samples in field with more of 20 centimeters of depth, causing the minimum disturbance in their properties and structure.

These new implementations in the rainfall simulator also allow collect water samples of runoff in two ways: firstly, the rain water that constituted the overland flow or direct runoff and besides the rain water seeps into the soil by the process of infiltration and contributed to the subsurface runoff. Among main the variables controlled in the rainfall simulations were the soil slope and the intensity and duration of rainfall.

With the aim of test the prototype, six soil samples were collected in the same sampling point and subjected to rainfall simulations in laboratory with the same intensity and duration. Two samples will constitute the control test, and they were fully undisturbed, and four samples were subjected to controlled burnings with different fire severity: two samples burnt to 250ºC and the other two samples burnt to 450ºC.

Preliminary laboratory data of soil erosion and surface and subsurface runoff were obtained. The water parameters analysed were: pH, electrical conductivity, temperature (in the moment of sampling) and suspended sediments, ammonium, nitrates, total nitrogen (Kjeldahl method), within 24 hours after sampling.