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Modelling the spatial distribution of the erosive behaviour within an olive orchard microcatchment with a spontaneous grass cover in Spain

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Abstract:
Olive orchards located in mountainous or hilly landscapes in Southern Spain have been identified as one of the major sources of sediments water stream in the region. This communication will present a modelling study of the magnitude and spatial distribution of the sediment sources within a small olive orchard, 6.1 ha, forming a microcatchment in a mountainous area. The model used was SEDD (Ferro and Porto, 2000) calibrated using rainfall, runoff and soil erosion patterns monitored over a three-year period. Although, the data series is not definitely complete, 46 events were observed. SEDD allowed an analysis of the erosive behaviour and the Sediment Delivery Ratio in the catchment on monthly and annual scale.

A high variability in catchment responses was observed according to differences in the storms and to the effect of the cover. Maximum intensities of 30 minutes were well-correlated to the values of peak flow, the runoff and load sediments. A reduced group of two or three erosive events happened mainly for the autumn season were responsible for the most of runoff and sediment loads in the year while the impact of spontaneous grass cover was appreciated on the events occurred for the spring season where despite high runoff depth the sediment transport was low. This bimodal tendency justified the calibration of SEDD model through the both medians of b-values of the period February-June and September-January. The results of the calibration (E = 0.97 and RMSE=0.03 t.ha-1) confirmed the applicability of SEDD to predict soil loss in the microcathment and to allow to complete the data series. On event scale, the variation coefficients ranged from 101% to 247% according to the tendencies observed in the sediment loads. Although mean annual SDRs in the catchment for the study period was of 3.1 %, a high spatial variability was found in the identified geomorphological units with values between 0.3 % and 13.7%. The location of these main sediment sources areas will allowed the design of more efficient management plans in terms of reducing sediment discharge to water streams.

REFERENCES
Ferro V, Porto P. 2000. A sediment delivery distributed (SEDD) model. Journal of Hydrological Engineering, ASCE 5(4): 411–422.