

Derived flood frequency analysis accounting for variability in hillslope processes

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In-depth analyses of unsaturated zone processes and soil-vegetation-atmosphere interactions are essential for a better understanding of possible climatic change phenomena as well as the occurrence of extreme hydrological events. The theoretically-based distribution of floods recently derived by Fiorentino & Iacobellis, ["New insights about the climatic and geologic control on the probability distribution of floods", *Water Resources Research*, 2001, 37: 721-730] was applied in 20 basins, previously classified by the use of a climatic index, in a wide area of Southern Italy. This work demonstrated that processes at the hillslope scale strongly influence the basin response by means of the different mechanisms of runoff generation. Also, climate plays a major role: in dry zones the basin water loss parameter decreases as basin area increases, whereas in humid zones this parameter seems independent from the basin area and very sensitive to simple climatic index. The objectives of the present work are: (i) to apply the model proposed by Iacobellis and Fiorentino to a small catchment which can be viewed as a test site, (ii) to examine whether, and to what extent, a suitable parameterization can be established accounting for soil physical and hydraulic properties, vegetation characteristics, and land-use. This work should be intended as a preliminary study to develop a methodology of evaluating hillslope hydrologic response from knowledge of soil information and vegetation data. The research site is the catchment of River "Fiumarella di Corleto", which is located in Basilicata Region, Italy, and has a drainage area of approximately 32 km². The environment has a rather dynamic geomorphology and very interesting features from the soil-landscape modeling viewpoint [Santini A., A. Coppola, N. Romano, and F. Terribile. 1999. Interpretation of the spatial variability of soil hydraulic properties using a land system analysis. In *Modelling of Transport Processes in Soils*, J. Feyen and K. Wiyono, eds., p. 491-500, Wageningen Pers, Wageningen, The Netherlands.]. A soil-landscape map was set-up and undisturbed soil cores, spaced 50 m apart, were regularly collected from the uppermost soil horizons along transects located at the two sides of the river. All cores were subjected to laboratory measurements to determine bulk density, particle-size distribution, organic carbon content, and unsaturated soil hydraulic characteristics.