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A comprehensive framework for the application of IF and TCIF theoretically derived distributions in Southern Italy

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An increasing amount of evidence is now available for demonstrating how flood series often incorporate data coming from different populations, thus emphasizing the need to understand the physical nature of floods before carrying out their probabilistic analysis. Theoretically derived distributions of floods were introduced by Eagleson (1972) as an alternative, probabilistic and physically based modelling of processes responsible for flood generation. Based on this framework, Iacobellis and Fiorentino (2000) proposed the IF probability model in which the direct contribution to peak flow is obtained as the product of partial contributing area and the discharge per unit of area, both considered as random mutually dependent variables. Moving from the consideration that floods can be triggered by different runoff productions mechanisms, Gioia et al. (2008) introduced the TCIF probability model. IF and TCIF distributions were successfully applied on a wide area of Southern Italy, which includes Puglia, Basilicata and Calabria regions, providing advances in the understanding of physical phenomenology of flood generation in these areas. In our research we revisited the parametric structure of these theoretically derived distributions applied in the entire Southern Italy, exploiting, among other, the availability of updated rainfall data and previous knowledge developed within the framework of VAPI project. Results showed the good performances of both distributions in fitting annual maxima of flood data, highlighting how IF and TCIF distributions possess a solid background for interpreting the actual underlying flood generation processes. Findings of the study can represent a reliable source of information for supporting model selection activities at both local and regional scales.