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# How the basin characteristics influence the climate change impact on flood frequency

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Extreme hydrological events are increasing in magnitude and decision-makers expect reliable information on future climate scenarios as a basis for adaption strategies. In this context, identification of measures requires the estimates of changes in the frequency and magnitude of floods. For this purpose, global circulation models (GCMs) may address the matter by providing the climate change scenarios that are used as input for hydrological models. However, for small/medium catchments (<1000 km2) the spatial resolution of GCMs climate scenarios is inadequate for forcing a hydrological model and downscaling techniques are required, e.g. statistical based on bias correction, or dynamical, using regional climate models (RCMs) which are initialized by GCMs. Therefore, the downscaled future time series, reflecting an established scenarios, are used as input in the rainfall-runoff modeling to simulate the hydrological response to climate forcing. Each step in this chain introduces, however, uncertainty mainly for the too many variables involved in the hydrological processes and the reliability of climate change impact studies might be poor. Therefore, the issue could be overcome by capturing the most important hydrological processes that affect the change rather than identify the magnitudes of changes.
Based on that, this study addresses the hydrological sensitivity of catchment to climate changes as a function of the soil, land use and topographic characteristic by a procedure based on: 1) downscaling several GCMs climate scenarios using approach, the Quantile Mapping statistics approach in this case; 2) generating long-term hourly time series of rainfall, temperature and discharge through stochastic weather generators and used to initialize a continuous rainfall-runoff model; 3) assessing the changing of frequency of annual maxima rainfall and discharge for the future period. For assessing how the hydrological sensitivity may depends on geomorphological characteristics of catchment, the described procedure is applied in different sub-catchments of the Upper Tiber River basin and the differences in terms of projected flood frequency are investigated in relation to the catchment properties. Moreover, the effect of climate change on the distribution of the soil moisture conditions at the beginning of the flood events is analyzed as well, considering that this variable plays a major role in the flood formation of Mediterranean basins.