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A discussion on assessing climate-related hazards and uncertainties considering scenarios of climate-change: Examples and applications to some African areas

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Extreme meteorological phenomena such as heavy precipitation, extreme temperature, or strong winds, may have considerable impacts on the economy, infrastructure, health, as well as may represent a non-negligible threat for human life. A changing climate may lead to changes in the frequency, intensity, spatial extent, duration, and timing of weather and climate extremes, and can result in unprecedented extreme events. Climatological parameters, that are reference variables for the assessment of climate-related hazards, can be generally obtained from data catalogues; nevertheless, it is often the case that the time window of the observations, if available at all, is too short for a correct analysis of the most extreme and less frequent events. For this reason there is a growing interest on the use of 'synthetic' data derived from climatological models which in addition, allow the possibility to perform climate projections considering different plausible emission/concentration scenarios in the modelling. Within this context, the scenario-based climate projections can be useful to assess possible temporal variations on climatological parameters (and hence in climate-related hazards) under climate change conditions. Here we discuss the characterization of some climate-related hazards based on the analysis of climatological parameters, debating relevant issues in the use of both observed and synthetic data, the consideration of climate-change scenarios, and the quantification and communication of uncertainties. In particular, to account for possible non-stationary conditions in the analysis of extremes under climate-change conditions, we have adopted a practical covariate approach recently used in different hydrological and meteorological applications, and used a Bayesian framework for the parameter estimation and uncertainty propagation.