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Future extreme precipitation frequency in the eastern Mediterranean: a new approach exploiting climate model projections

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Understanding extreme precipitation under changing climatic conditions is crucial to manage weather- and flood-related hazards. Global and regional climate models are able to provide coarse scale information on future conditions under different emission scenarios, but large uncertainties affect the projected precipitation amounts, extremes in particular, so that frequency analyses cannot be quantitatively trusted. This study uses, for the first time, the Simplified Metastatistical Extreme Value (SMEV) approach to directly exploit synoptic scale information, better represented by climate models, for obtaining projections of future extreme precipitation frequency.

We use historical rainfall data from >400 stations in Israel and Jordan to (a) provide a climatology of extreme daily precipitation (e.g., the 100-year return period amounts) in the steep climatic gradients of the region and (b) improve understanding of the SMEV description under changing climate. We demonstrate that, using SMEV, it is possible to (c) present the sensitivity of extreme quantiles to occurrence and intensity of Mediterranean lows and other synoptic systems, and (d) project future extreme quantiles starting from synoptic scale information generated by earlier climate-model-based studies. Under our working hypotheses, we project a general decrease of extreme precipitation quantiles for the RCP8.5 scenario; an increase is detected in the coastal region and the Negev arid lands. We discuss the apparent contrast of these results with previous findings.