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Assessment of Intensity-Duration-Frequency curves for the Eastern Mediterranean region derived from high-resolution satellite and radar rainfall estimates

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Intensity-duration-frequency (IDF) curves are used in flood risk management and hydrological design studies to relate the characteristics of a rainfall event to the probability of its occurrence. The usual approach relies on long records of raingauge data providing accurate estimates of the IDF curves for a specific location, but whose representativeness decreases with distance. Radar rainfall estimates have recently been tested over the Eastern Mediterranean area, characterized by steep climatological gradients, showing that radar IDF curves generally lay within the raingauge confidence interval and that radar is able to identify the climatology of extremes. Recent availability of relatively long records (>15 years) of high resolution satellite rainfall information allows to explore the spatial distribution of extreme rainfall with increased detail over wide areas, thus providing new perspectives for the study of precipitation regimes and promising both practical and theoretical implications.
This study aims to (i) identify IDF curves obtained from radar rainfall estimates and (ii) identify and assess IDF curves obtained from two high resolution satellite retrieval algorithms (CMORPH and PERSIANN) over the Eastern Mediterranean region. To do so, we derive IDF curves fitting a GEV distribution to the annual maxima series from 23 years (1990-2013) of carefully corrected data from a C-Band radar located in Israel (covering Mediterranean to arid climates) as well as from 15 years (1998-2014) of gauge-adjusted high-resolution CMORPH and 10 years (2003-2013) of gauge-adjusted high-resolution PERSIANN data. We present the obtained IDF curves and we compare the curves obtained from the satellite algorithms to the ones obtained from the radar during overlapping periods; this analysis will draw conclusions on the reliability of the two satellite datasets for deriving rainfall frequency analysis over the region and provide IDF corrections. We compare then the curves obtained from the satellite algorithms with the ones derived from the entire radar record assessing the reliability of the satellite datasets given their limited record length for a rigorous statistical analysis.