4.16 EXPLORING THE SPATIAL VARIABILITY OF EXTREME RAINFALL INTENSITIES AT RADAR SUBPIXEL SCALE USING A HIGH-RESOLUTION STOCHASTIC RAINFALL GENERATOR

N. PELEG[1], F. MARRA[2], S. FATICHI[1], A. PASCHALIS[3], P. MOLNAR[1], P. BURLANDO[1]

[1] Institute of Environmental Engineering, Hydrology and Water Resources Management, ETH Zurich, Zurich, Switzerland

[2] Institute of Earth Sciences, Hebrew University of Jerusalem, Jerusalem, Israel

[3] Institute Faculty of Engineering, Department of Civil and Environmental Engineering, Imperial College London, London, United Kingdom

nadav.peleg@sccer-soe.ethz.ch

Extreme rainfall intensities are often quantified using IntensityDurationFrequency curves (IDF) that are traditionally derived from rain-gauges and more recently also from remote sensing instruments, such as weather radars and satellites. These instruments measure rainfall at different spatial scales: rain-gauge samples rainfall at the point scale while remote sensing devices averages precipitation on a relatively large area. As a result, a remotely sensed derived IDF curve is representative of the mean areal rainfall over a given grid cell and neglects the within-grid cell rainfall variability. In this study, we quantify the variability of extreme rainfall intensity over a common C-band weather radar grid cell (of 1 km^2). We have used a high resolution space-time rainfall generator that downscales the rainfall intensities in space to a 10 m by 10 m resolution. The study was conducted using a unique radar data record (23 years) and a very dense rain-gauge network in the Eastern Mediterranean area (northern Israel). RadarIDF curves, together with an ensemble of point-based IDF curves representing the radar subpixel extreme rainfall variability, were developed fitting Generalized Extreme Value distributions to annual rainfall maxima. It was found that the mean areal extreme rainfall derived from the radar underestimate most of the extreme values computed for point locations within the radar pixel (on average, 70%). The subpixel variability of rainfall extreme was found to increase with longer return periods and shorter durations (e.g. from a maximum variability of 10% for a return period of 2 years and a duration of 4 h to 30% for 50 years return period and 20 min duration). For the longer return periods, a considerable enhancement of extreme rainfall variability was found when stochastic (natural) climate variability was taken into account. Bounding the range of the subpixel extreme rainfall derived from radarIDF can be of major importance for different applications that require very local estimates of rainfall extremes.