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Extreme desert flash floods: Insights gained from space-time precipitation characterization

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Rainfall in dry climate regimes is rare and often spotty, but occasionally rain rates are strong, and due to the typical low infiltration rates, flash floods may be generated. As rain gauge networks are very sparse in those regions, the study of rain storm characteristics and flash flood generation, for both process understanding and hazard warning, is highly benefited from weather radar systems. In this presentation, a compilation of weather radar-based studies of rainfall patterns, flash floods and their interactions in dry climate regimes is presented. The studies are conducted in the Negev and in the Judea deserts in Israel. Radar data were used to characterize rainfall patterns: their spatial coverage, shape, temporal evolution and rain rate distributions. Analysis of flash flood response to rainfall patterns have shown, as expected, a very high sensitivity. Specifically, it was found that flood peak discharge can increase by three folds as a result of small changes in storm location, direction and speed but without a change of storm magnitude. This approach is further explored and the concept of "storm flooding potential" is presented, defined as the largest flash flood a given storm can generate in a given catchment without changing the rain rates, coverage area or duration of the storm. From this analysis insights are gained regarding the hydrometeorological conditions at which extreme flash floods are generated in the desert.