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Towards flash flood prediction in the dry Dead Sea region utilizing radar rainfall information

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Flash-flood warning models can save lives and protect various kinds of infrastructure. In dry climate regions, rainfall is highly variable and can be of high-intensity. Since rain gauge networks in such areas are sparse, rainfall information derived from weather radar systems can provide useful input for flash-flood models. This paper presents a flash-flood warning model utilizing radar rainfall data and applies it to two catchments that drain into the dry Dead Sea region. Radar-based quantitative precipitation estimates (QPEs) were derived using a rain gauge adjustment approach, either on a daily basis (allowing the adjustment factor to change over time, assuming available real-time gauge data) or using a constant factor value (derived from rain gauge data) over the entire period of the analysis. The QPEs served as input for a continuous hydrological model that represents the main hydrological processes in the region, namely infiltration, flow routing and transmission losses. The infiltration function is applied in a distributed mode while the routing and transmission loss functions are applied in a lumped mode. Model parameters were found by calibration based on five years of data for one of the catchments. Validation was performed for a subsequent five-year period for the same catchment and then for an entire ten year record for the second catchment. The probability of detection and false alarm rates for the validation cases were reasonable. Probabilistic flash-flood prediction is presented applying Monte Carlo simulations with an uncertainty range for the QPEs and model parameters. With low probability thresholds, one can maintain more than 70% detection with no more than 30% false alarms. The study demonstrates that a flash-flood-warning model is feasible for catchments in the area studied.