REAL-TIME FLASH FLOOD FORECASTING IN SMALL FAST-RESPONDING WATERSHEDS USING A DISTRIBUTED RAINFALL-RUNOFF MODEL

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Flash flooding poses a significant danger to life and property in small fast responding watersheds of the mountainous eastern United States. Effective warnings can be produced if the magnitude and timing of peak flash flooding can be predicted. A distributed model operating at an appropriate time scale, using precipitation input at commensurate time and spatial scales, would provide forecasters with such a tool. The Kinematic Runoff and Erosion Model (KINEROS2) is a spatially distributed watershed model that can assimilate real-time, high resolution Doppler weather radar data. KINEROS2 currently uses the Digital Hybrid Reflectivity (DHR) radar product as precipitation input. The DHR product has an average 1-degree by 1-km spatial resolution and a 4 to 5 minute temporal resolution. KINEROS2 is run using time steps that match those of the DHR product. Multiple Z-R relationships can be applied to account for uncertainty in radar precipitation estimation.

KINEROS2 has been calibrated for basins smaller than 250 km^2 located in the Catskill Mountain region of New York State. Based on model calibration results and observations of running KINEROS2 in a humid regime, a number of improvements have been identified. One improvement is to couple KINEROS2 with a subsurface/inter-storm model. This would transition KINEROS2 from functioning as an event-only model to a continuous model. Another improvement would be the addition of an energy-balance snow model, allowing all-important rain-on-snow events to be modeled and making KINEROS2 a true four-season model.