Doppler Radar Flash Flood Detector

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A Doppler Radar System is presented that is suitable for observing sudden changes of streamflow. Features of the system include a commercially available Doppler radar transceiver and Digital Signal Processing allowing flow rate detection and false alarm rejection. False alarms are prevented by comparing the theoretical radar signature of flowing water with the observed radar signature. The theoretical signature was created by scanning a virtual river and determining the distance and azimuth and altitude angles to the radar transceiver. The Doppler frequency and the signal power were determined and this scanned data was combined to create the Doppler signature or spectrum of the flowing water. The radar system sampled the Doppler signal and a Fast Fourier Transform (FFT) converted this data to an audio frequency spectrum. This was averaged to reduce signal noise due to the chaotic nature of water flow. Background suppression is accomplished by subtracting previously collected spectra from the current sample. The sample spectrum was then analyzed for velocity and compared to the theoretical Doppler signature. A positive signature match and increase in water flow velocity will trigger a radio alarm. Radar signatures of flowing water were collected from streams of different flow rates. Additionally the signatures of vegetation and animal movement were collected. These signatures were analyzed and used to create the signature analysis algorithm. The system was successful in detecting sudden increase in water flow while rejecting false alarms created by vegetation and animal movement.

Awards Won:

American Meteorological Society: Third Award of $500