Hydrology Seminar

Relative Flash Flood Potential Index (FFPI)

Greg Smith
Colorado Basin River Forecast Center
National Weather Service
National Oceanic and Atmospheric Administration

The recent modernized method for generating gridded flash flood guidance (FFG) relies significantly on the soil moisture states of the National Weather Service River Forecast System (NWSRFS) Sacrament Soil Moisture Accounting Model (SAC-SMA). The SAC-SMA tension water component or "tank" deficits must be overcome before runoff is generated. These SAC-SMA parameters are generally calibrated for basins much larger than those typically associated with flash floods in the southwest United States. These SAC-SMA parameters are not scaleable to smaller basins and frequently the tension water deficits become very large resulting in significantly inflated FFG values. This method also requires that a SAC-SMA segment exist for the area for which FFG values are desired. The heavy reliance on soil moisture and lack of blanket NWSRFS SAC-SMA coverage has limited the application of the modernized FFG generation method in the southwestern U. S., particularly in areas where rainfall intensity and land characteristics are the primary factors affecting the occurrence of flash floods. In areas where the modernized FFG method is not employed, FFG is usually based on local methods, knowledge, or 'rules of thumb'. With these latter methods the FFG usually lacks adequate spatial resolution to take complete advantage of the Flash Flood Monitoring and Prediction (FFMP) application. The core function of the FFMP is to map reflectivity information from radar bins to pre-defined hydrologic basins. The application derives rainfall rates and associates rainfall accumulations with each hydrologic basin. A limitation of the FFMP-FFG system is its inability to discern basin physiographic characteristics. To FFMP basin rainfall accumulations, rate, and FFG-exceeding values may be treated equally regardless of a basin's physiographic make-up, such as soil type, slope, forest cover, or level of urbanization.

A theoretical index that represents a basin's level of hydrologic response to heavy rainfall was developed at the Colorado Basin River Forecast Center. The derivation of this relative flash flood potential index (FFPI) requires raster (gridded) datasets of soil type, forest cover, land-use, slope, and, where available, wildfire burn information. Subjective factors of importance have been applied to the attributes associated with these data types resulting in an index ranging from 1 to 10. Grid cells with higher values would then have a hydrologic response and thus greater relative flash flood threat based on these physiographic characteristics. The analysis was performed in a GIS environment and grid cells were then summarized to provide an index for the same hydrologic basins used by the FFMP application. The goal was to provide a simplistic index to assist users of FFMP in discerning how these hydrologic basins might react. The FFPI concept has generated a surprising level of NWS as well as international interest. The FFPI has been adopted by the AHPS FF Services Team as a priority project and it will be evaluated to determine its applicability in non-western offices. As part of the AHPS plan the methodology will be re-evaluated, finer resolution datasets incorporated, and use of a soil moisture component explored. The possibility of deriving FFG from the FFPI will also be examined. The FFPI has generated interest internationally as it currently can provide some level of information about the flash flood threat in areas void of a hydrologic network or that lack hydrologic modeling, much like remote areas of the southwest United States.

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Location: NWS Headquarters
1325 East West Highway, SSMC#2, Room 8246
Silver Spring, Maryland

Contact: Pedro Restrepo
Pedro.Restrepo@noaa.gov