



Extreme Rainfall From Orographic Thunderstorms in the Central Appalachians

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The central Appalachian region has experienced some of the largest rainfall accumulations in the world at time intervals less than 6 hours, including the 18 July 1942 Smethport, Pennsylvania storm which produced 780 mm in less than 5 hours. The envelope curve of central Appalachian flood peaks at "small" drainage areas (less than 1000 sq. km.) is dominated by orographic thunderstorm systems, like the Smethport storm. Analyses of cloud-to-ground lightning observations show that there is pronounced spatial heterogeneity of thunderstorm frequency over the central Appalachians with local maxima along the eastern and western margins of the region and a local minimum in the interior Valley and Ridge physiographic province. Orographic thunderstorm systems that produce catastrophic flooding in the central Appalachians are examined through observational and numerical model analyses using the Weather Research and Forecasting model. Contrasts between "terrain-locked" thunderstorm systems that produced catastrophic flooding along the eastern margin of the central Appalachians and "July 18" storms along the western margin of the central Appalachians are examined.