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Physical Modeling of Hydrologic Processes in South Central Texas

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Flood magnitude and recurrence modeling and analysis play an important role in water resources planning, management, and permitting. In both urban and rural situations, flood analysis is important to flood plain mapping and the development of best management practices for both environmental and engineering concerns. The majority of annual precipitation in South Texas results from extreme, large storm events, which produce flash floods (the number one cause of weather-related deaths in Texas). Surface geology such as such as Edward out crop faulting zone at Balcones escarpment has different properties than the classified soil; affect the soil parameters such as infiltration or hydraulic conductivity. This result in a very high infiltration and channel loss as a recharge component to the Edward aquifer from the surface runoff and rivers that are crossing the recharge zone, such as Nueces, San Antonio, Guadalupe and Colorado Rivers.
Water quality is another issue in hydrological modeling, specifically in south central Texas. Water quality assessment is another issue on hydrological modeling in south central Texas. SWAT Soil and water assessment tool model is used for water quality assessment in San Antonio River basin since the rainfall runoff simulation is a necessity to derive the surface water quality process especially in the streams. With the advances in the Geographical information system (GIS) and instant precipitation products such as next generation radar (NEXRAD) and data acquisition for these products, the accuracy of the hydrological models has improved. Different hydrological models were used to evaluate the surface water and other hydrological cycle components in different watersheds in south central Texas through different events and their different causes and effects in these watersheds. Some of them are semi distributed and lumped models such as Soil and Water Assessment Tool (SWAT), Hydrologic Modeling System (HEC-HMS) and physically based distributed model Girded Surface Subsurface Hydrologic Assessment GSSHA taking the advances of GIS, NEXRAD product, remote sensing and other product such as gridded land use and soil map to achieve the highest accuracy of these models.