Hydrological Extremes, Probable Maximum Events and Water-Related Disaster Management

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This lecture describes recent hydrological and meteorological situations in the world in terms of extreme events and related hazards and disasters. The time series of annual maximum precipitations at many places are analyzed by using traditional frequency methods such as the Gumbel distribution and the generalized extreme-value (GEV) distribution. The lecturer proposes the usage of empirical distribution for time series longer than 100 years, because the time series analysis becomes an interpolation problem when estimating 100-year events. Also discussed is the probable maximum precipitation (PMP), which can give us the probable worst case that brings devastating damages to people and communities. To estimate longer return-period quantiles (200-, 300-, 500- and 1000-year events) the PMP can be used as the upper bound of probability distribution for frequency analysis. The accuracy of estimated quantiles is evaluated by the bootstrap resampling methods. Radar information for recent severest meteorological/hydrological events can give us the depth-area-duration (DAD) relationship as well as intensity-frequency-duration (IDF) curves, which are very useful for practical engineering to design and construct hydraulic structures for flood control and water-related disaster management. The lecture indicates some record-breaking phenomena from the information obtained by radar observation systems.