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Regional precipitation-frequency analysis and spatial mapping for 24-hour and 2-hour durations for Wahington State

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This study is an update of the information contained in the precipitation-frequency atlas published by the US National Weather Service in 1973 (NOAA Atlas 2^{1}). Data collection for the NWS study ended in 1966 while this study uses the current data base which more than doubles the record length used in the NWS study.

Washington State has highly variable topography and climate; in particular Mean Annual Precipitation (MAP) varies from over 260 inches a year to less than 7 inches. Steep high mountain ranges provide very wet slopes as well as pronounced rain shadows with large climate changes occurring in relatively short distances. In addition there are 4 distinct sources for the atmospheric moisture needed for precipitation which gives rise to complex seasonal and spatial interactions.

The PRISM mapping system used in this study has greatly improved the spatial mapping of precipitation and increased the reliability of estimates of precipitation in the broad areas between precipitation measurement stations. Further the development and use of regional L-Moments has greatly improved the reliability of precipitation magnitude-frequency estimates, particularly for the rarer and more extreme storms.

We found that the State could be adequately specified by 12 regions for the purposes of estimating the 2-hour and 24 hour precipitation frequencies. Within each region algorithms were developed for L-CV and L-Skewness expressed as functions of the MAP. The GEV distribution was statistically acceptable for all regions up to the 1 in 500 recurrence interval, beyond which the 4 parameter Kappa distribution is recom-

mended.

The estimated changes in precipitation magnitudes for a given frequency as one crossed regional boundaries were found to be small, and well within that expected differences likely to come from sampling errors. An interesting transition zone was observed at the eastern edge of the Cascade foothills, associated with the maxima having a seasonal change from fall-winter frontal storms in the west to a spring-summer thundershower maxima in the east.