**Mixed Population Floods – Regional Analysis and Climate**

**Study Questions**

General questions (if not already done)

1. Are there discernible regional or other patterns to flood-mechanism dominance?
2. Are there differences in the magnitude of floods depending on the dominant mechanism?
3. How different are frequency curves estimated using mixed populations vs. a single population? (Is this difference a factor in whether consideration of mixed populations is important for regional analysis?) Can we identify conditions that cause the tails to diverge even if the single population curve appears to fit reasonably well?

Regional Analysis

1. Can the mix of floods (or dominant flood mechanism) be used to define subregions in regression analysis? How do results compare to state-wide regressions, or regressions using other methods for defining subregions?
2. Can separate regional regression equations be developed for each flood mechanism and then combined at a single location? Since a single location may not have enough floods of each type, this might entail use of something similar to the “hybrid” method described by Hjalmrason and Thomas (1992) or Sando and others’ (2008) pooled flood frequency for extreme floods.
3. For an ungaged location, how would the mix of floods be determined? Or, how would an ungaged location be placed in the appropriate subregion?
4. When is it important to consider mixed populations in regional analysis? Can we identify criteria for when it is likely to make a difference? Does it depend on how well we can fit a curve given an assumption of a single population? Does it depend on some threshold of differences among the stations under consideration?

Applicability to Climate Change and Climate Variability

1. What are climate model projections for the different flood mechanisms in Arizona?
2. How do we use the (fuzzy) model projections to alter the estimated flood frequency curve?
3. Could this concept be used to produce different flood frequency curves for the same gage? For example, one for El Nino years, one for La Nina years?

**References**

Hjalmarson, Hjalmar W. and Blakemore E. Thomas (1992), New Look at Regional Flood-Frequency Relations for Arid Lands, Journal of Hydraulic Engineering, 118(6), 868-886.

Sando, Steven K. , Daniel G. Driscoll, and Charles Parrett (2008) Peak-Flow Frequency Estimates Based on Data through Water Year 2001 for Selected Streamflow-Gaging Stations in South Dakota, U.S. Geological Survey Scientific Investigations Report 2008-5104, 367 p.