國立臺北大學自然資源與環境管理研究所
101 學年度第一學期『環境災害與風險管理』

課程講義（十）：風險評估數學概要與極值統計學
Introduction to Mathematics for Risk Analysis and Statistics of Extremes

http://statisticaloutsourcingservices.com/Outlier2.pdf
 A Review of Statistical Outlier Methods
http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.135.3825&rep=rep1&type=pdf
 Statistics of extremes in hydrology
http://ind.ntou.edu.tw/~ktlee/hydrology/CH.9.pdf 水文統計與頻率分析

- INTRODUCTION
  - □ Acceptable Risk, Probability of Exceedance, and Extremes
  - □ Outlier vs. Extremes; Outlier Test (Woodside and Kocurek, 1997)
    - ⇨ Method based on Inter-Quartile Range: $IQR = Q_3 - Q_1$; $Q_1 - 1.5IQR$] $[Q_3 + 1.5IQR$
    - ⇨ Grubbs' T Test; Dixon's Outlier Test; Youden's Rank Test for Laboratories
  - □ Extreme Event Analysis and Extreme Value Theory

- FUNDAMENTAL STATISTICS RELATED TO RISK
  - □ Mode, Mean, Median and Range; Higher Order Moments
  - □ Outliers vs. Extremes; Risk, Safety and Reliability
  - □ Normal Distribution and 6-Sigma => Standard Deviation, Normality => Log-Normal
  - □ Value at Risk (VaR): Originally VaR was intended to measure the risks in derivatives markets. Currently VaR is widely applied in financial institutions to measure all kinds of financial risks

- STATISTICS OF EXTREMES
  - □ What are Extreme Value Statistics (http://www.assessment.ucar.edu/toolkit/index.html)
        Extreme value statistics are used primarily to quantify the stochastic behavior of a process at unusually large (or small) values. Particularly, such analyses usually require estimation of the probability of events that are more extreme than any previously observed. Many fields have begun to use extreme value theory and some have been using it for a very long time including meteorology, hydrology, finance and ocean wave modeling.

  - □ Some Generic Approaches
    - ⇨ Weibul Plotting Position
    - ⇨ Q-Q Plot (Normality Test)
  - □ Return Period vs. Design Flood
  - □ Software Packages
    - ⇨ Palisade @Risk, Oracle Crystal Ball
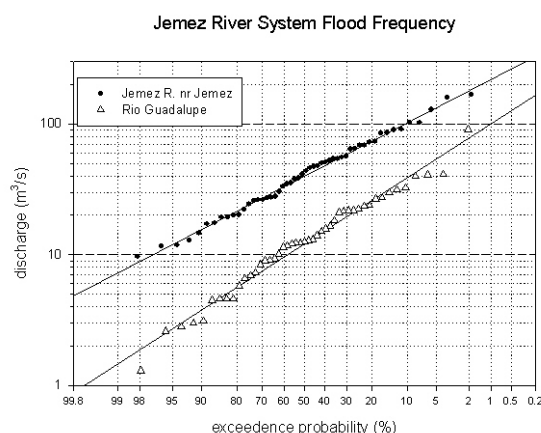
- HOMEWORK ASSIGNMENT #5 (2012/11/29 Due): 請至「台灣地區河川流量站資料庫」網站，選定紀錄年期 35 年以上之流量站以查詢其河川流量水文資料，並摘要整理瞬時洪峰流量頻率分析之結果，如分配型態、配適度、再現期 100 年洪峰流量等。