

STANFORD UNIVERSITY  
DEPARTMENT OF STATISTICS  
SPECIAL SEMINAR

4:15 p.m., Wednesday, October 4, 2000  
Sequoia Hall Rm. 200  
(Cookies at 3:45 in 1st Floor Lounge)

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**Ordered Multivariate Extremes**

In recent years statistical extreme value theory has matured to such an extent to contribute usefully to the study of substantial real problems, particularly in the area of environmental extremes. Examples include the design of off-shore structures (Coles and Tawn, 1994) and the study of reservoir flood safety (Anderson and Nadarajah, 1993).

A fairly commonly occurring characteristic is that the variables whose extremes are of interest are ordered. In hydro-meteorology one thing that is of interest is the dependence of extreme values of  $d$ -hour rainfall over a range of values of  $d$ . One approach is to fit a multivariate extreme value distribution over that range. If  $X(d)$  denotes rainfall aggregated over  $d$  hours, and if  $\hat{d} > d$  then  $X(d) \leq X(\hat{d}) \leq (\hat{d}/d)X(d)$  for all  $(X(d), X(\hat{d}))$ , so an order restriction in the multivariate extreme value model is needed. Similar order restrictions arise in the study of the joint distributions of large hourly mean wind speeds and large wind gusts.

The aim of this talk is to develop multivariate extremal models and associated statistical procedures for vector observations whose components are subject to an order relationship. We consider only the bivariate case. The results are applied to the joint analysis of rainfall extremes corresponding to different durations.