Learning outcomes: Chapter 6

1. You should be able to give reasons, with examples, why we might consider a bi/multi-variate analysis of extremes:

(a) The simultaneous observation of extremes of a single process at many locations;

(b) The simultaneous observation of extremes of more than one process at a single location;

(c) To model the evolution of a single process by considering the joint distribution of consecutive extremes (i.e. an alternative way of handling dependence; see Chapter 4).

2. You should understand the notation used for *componentwise maxima*, and you should know that the limiting distribution for the vector of bivariate componentwise maxima can be written as

$$\exp\{-V(x,y)\},$$

where the marginal distributions for X and Y are standard Fréchet and V has a certain form depending on the model assumed for extremal dependence.

3. You should be aware that there are models for V which allow for symmetry and asymmetry in the dependence structure, including the *logistic* and *bilogistic* models respectively, although you will not need to memorise the forms of these models (You should, however, memorise the role of the dependence parameters in these models).

4. You should understand the two-stage process involved in estimating the dependence structure between bivariate extremes, and you should understand how the likelihood for a dependence model is constructed in a bivariate threshold excess approach. You should be able to do this analytically for the logistic model.

5. You should be able to obtain simple bivariate threshold excess probabilities using the logistic model, and formulate suitable comparisons assuming the independence case.

6. Using output from the evd package, you should be able to interpret fits to both the logistic and bilogistic models, and compare the two models appropriately.