Modelling the Probable Maximum Precipitation for Large Catchments

Project Outline:

Background: Several of SunWater's dams have catchments that are among the largest in the country and are subject to some of the most intense and extreme rainfalls on earth. The "Generalised Tropical Storm" method is currently best practice and used by water authorities and government agencies to estimate the probable maximum precipitation (PMP) for Australian catchments up to 150,000km^2. These estimates are subsequently used in planning to assess spillway size and consequently for cost benefit analysis with regard to viability of upgrades or new dams. Estimates are also used for dam safety purposes to ensure the dam can withstand extreme flood events.

Motivation: The methodology given in the "*Australian Rainfall and Runoff*" handbook assigns the probability of PMP events occurring to be a (strong) function of catchment area, meaning that for large catchments, there is a very high likelihood of PMP events occurring.

Under the current State Government Dam Safety Guidelines, the tolerable risk of this probability is classed as unacceptable when the estimated population at risk is taken into account. For very large catchments (including some managed by SunWater) the current methodology means that it is virtually impossible to reduce risk without removing population (which is not ideal or even possible in many situations) or constructing a dam that is significantly larger than might be required. In turn this means that such water supplies are unlikely to be economic for water users.

The statistical methodology that makes temporal and spatial event probability a function of catchment area is needs a closer analysis.

The Task: The questions to be considered in this MISG project are, firstly, how can we assess whether the current methodology is reasonable and if not, at what size catchment does it cease to be so? Secondly, are there alternative approaches to determining the probability of extreme catchment rainfall events (as opposed to making probability of a weather event a function of a certain area)? Is there a more appropriate way to solve the probability of extreme rainfalls, through their combinations and permutations, over very large catchments?

Information on the current methodology and real large catchments, including historical rainfall data will be supplied by the industry partner to assist with this project.