Introduction:

A Statistical Model (SM) has been developed to downscale large scale predictors given by Global Climate Models (GCMs). This is a complementary approach to the dynamical modeling of regional climate change using high resolution nested models. It allows to bridge the scale difference ("downscaling") between coarse grid Coupled Atmosphere-Ocean GCMs and the finest temporal and spatial scales required for regional and environmental impact studies of climate change. The analogue technique was chosen for this study as it has proven successful in the past for mid-latitude climate and in particular for forecasting in Australia. Furthermore, statistical techniques allow the reconstruction of time series and therefore consider extreme events such as spells of anomalous temperatures. Analogues are based on large scale atmospheric predictors (e.g. Mean Sea Level Pressure, geopotential height or atmospheric thickness) for which GCM are considered to be "trustable" or at least more reliable than for grid-average of surface observations. Predictor series are then obtained from these functions with a high temporal distribution (e.g. daily). Hence, climatic issues related to extreme events can be investigated (e.g. frost days, anomalous spells and return of extremes). This is a key area of research where insufficient effort has been devoted so far.

The aim of this research is to:

- Develop a system to statistically downscale information provided by climate models at local observational level.
- Obtain sufficient skill to match local extreme temperature observations in two major Australian agricultural areas.
- Insure that temperature series constructed with the statistical model are more realistic than direct outputs from climate models.
- Assess the usefulness of such reconstructed series for impact studies in particular for anomalous spells