PROJECT 3.2: *CLIMATE EXTREMES: POTENTIAL FORECAST SKILL AND CLIMATE CHANGE SCENARIOS*

Principal Investigator

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Key research findings and highlights

Milestone 3.2.1 *Literature review documenting current work on predictors of extreme rainfall.* This milestone was due for completion at the end of 2008 but an extension until June 2009 is requested. A draft report has been prepared but requires editing for completion.

Milestone 3.2.2 *Potential forecast skill for extreme rainfall at seasonal timescales* — Preliminary work shows that patterns of extreme rainfall in the central wheat belt depend on the active synoptic system – frontals systems or cut-off lows. This milestone was due for completion at the end of 2010 but an extension until June 2011 is requested due to knock-on effects of delays in processing pluvio data for Milestone 2.4.2.

Milestone 3.2.3 *Dissemination of climate change scenarios for seasonal extreme rainfall as regional maps*. This milestone was due for completion at the end of 2011 but an extension until May 2012 is requested due to knock-on effects of delays in processing pluvio data for Milestone 2.4.2.

Milestone Reports

Milestone 3.2.1 *Literature review documenting current work on predictors of extreme rainfall*

Draft report has been prepared; requires light editing to complete.

Milestone 3.2.2 *Potential forecast skill for extreme rainfall at seasonal timescales*

Pook and Risbey (CAWCR, CSIRO Hobart) investigated synoptic classifications, and they showed that fronts are the dominant synoptic systems in the central wheat belt, contributing 50% of rainfall, while cut-off lows contribute approximately 33%. Cut-off rain has declined in the past 30 years, but frontal rain does not show a trend. This has possible implications for analysis of extremes. We have use Pook and Risbey's classification for 1979-2008 to split daily rainfall data into frontals vs cut-off low datasets. A separate generalised extreme value analysis on each set shows differences in the characteristics of extreme rainfall for the two classifications. This indicates we need to consider extremes of both types in our analyses, and further analysis is awaiting synoptic classification for 1958-2008 to be completed.

The high quality data sets described by the BoM are spatially sparse in SWWA. We have therefore used raw rainfall data sets to increase the spatial coverage, with the aim of carefully scrutinising them to ensure that we can select the top *r* rainfall values for a season within a year. Note that the model we use does not require continuous runs of data over seasons, so we can be less stringent in our requirements. We use not only daily rainfall records but also

data from pluvio graphs (essentially continuous measurements of rainfall). BoM data has been supplemented with data from DAFWA and the Department of Water.

Processing of the pluvio data (essentially to extract the top *r* order statistics from a range of durations from approx 5 minutes though to three days) has been very slow, leading to slippage in analysing the data, but has now been rectified. Delays have also arisen due to the need to modify code to take account of the minimum time step varying over the pluvio data sets.

Analyses have shown that it is permissible to have a simple model for rainfall extremes over the full range of durations of interest (approx 5 minutes though to 3 days) reducing the required number of parameters at a station from 36 to 5 (in simple cases).

Amalgamation of daily and pluvio data sets have commenced. The extremal index, which is a correction factor for adjusting the GEV of daily data to that corresponding to 24 hourly data, has been calculated for all sites.

Milestone 3.2.3 *Dissemination of climate change scenarios for seasonal extreme rainfall as regional maps*

Amalgamation of daily and pluvio data sets have commenced. Derivation/calculation of site dependent covariates (eg distance from coast, height above sea level) has commenced

Summary of new linkages to other IOCI 3 Projects

Nil

Summary of any new research opportunities that have arisen

Statistical issues in modelling different types of synoptic systems require development of statistical models that recognise the different types of systems. Currently we analyse them separately.

List of publications accepted and submitted

Nil

List of IOCI-related presentations at national or national and international conferences, symposia and workshops.

Campbell, E., "Modelling of extreme rainfall" CSIRO CAF Science Symposium, Melbourne, February 2010

Campbell, E., "Modelling of Extremes" CSIRO CAF theme meeting, Melbourne, March 2010

Campbell, E., "Modelling of Extremes" DCCEE meeting on extremes, BoM Melbourne, May 2010

Campbell, E., "Wringing wet data dry, Getting the most out of rainfall data: An extreme view. CSIRO MIS meeting on extremes, Perth June, 2010

Campbell, E., "Spatial-Temporal Modelling of Extreme Rainfall" Presentation at 11th International Conference on Statistical Climatology, Edinburgh, July 2010

Campbell, E., "Spatial-Temporal Modelling of Extreme Rainfall" Poster at 25th International Workshop on Statistical Modelling, Glasgow, July 2010