Victorian Climate Initiative

PROJECT WORKPLAN

21 May 2013 – 20 May 2014

1. Project Definition

Project ID	VicCI - Project 6
Project Title	Convection-resolving dynamical downscaling
Project Leader	Name: Marie Ekström Contact: 02 6246 5986 email: Marie.Ekstrom@csiro.au

2013	Milestone	Achievement Criteria	Due date
1	Six-monthly progress report including (1) Progress against deliverables, (2) Research effort over the period, (3) Science achievements, (4) Publications/presentations, (5) Communications	Report accepted by Project Management Committee for incorporation into overall Progress Report to be submitted to the Steering Committee	28 Oct 2013
2	Technical Report to be published in the report series of CSIRO's Water for a Healthy Country Flagship.	Submitted for internal review via CSIRO e-publish system.	21 Apr 2014
3	Twelve-monthly progress report with the same 5 sections	Report accepted by Project Management Committee for incorporation into overall Progress Report to be submitted to the Steering Committee	21 Apr 2014
4	Draft Annual Work plan for next year	Work plan accepted by Project Management Committee to be recommended to the SC	21 Apr 2014
5	Report on research undertaken for year (objectives, methods, results, discussion, conclusions, links to other projects, next steps) as contribution to the Program Annual Research Report	Report accepted by Project Management Committee for incorporation into overall Program Annual Research Report to be submitted to the Steering Committee.	1 May 2014

2. Project Details

Introduction:	Methods used within SEACI for deriving projections of future climate were best suited to providing estimates of annual and seasonal rainfall means. A key weakness of the methods used was the underestimation of the magnitude of extremes and shorter term rainfall characteristics. In preparation for delivery of the next round of Water-Supply Demand Strategies (WSDS) in 2016 there is a need to investigate other downscaling methods that better capture the temporal variability of local to regional rainfall. In Project 6, we investigate the usefulness of convective resolving dynamical downscaling for this purpose. Work by the UK MetOffice suggest that convective resolving RCMs outperform 10-12 km runs in terms simulating location and intensity of rainfall events (Kendon et al., 2012). Our purpose is to investigate if convective resolving models are purposeful for downscaling rainfall for water supply studies, particularly when compared to outputs from coarser scale RCMs using parameterised convection. In Australia, there are two established models that are used for climate change experiments on regional scale (Conformal Cubic Atmospheric Model (CCAM),(McGregor and Dix, 2008); Weather Research and Forecasting (WRF),(Skamarock and Klemp, 2008)), and one being developed for use in regional applications (Australian Community Climate and Earth System Simulator (ACCESS), (Bi and Marsland, 2010). Of CCAM and WRF, only WRF is able to simulate regional climates on the very high spatial resolution that is of interest in this project. Within CMAR, WRF is currently used to track cyclones, however the model set up is different to what will be required for the research activities in Project 6. Thus, for the first stage in VicCI, project 6 activities will focus on identifying a model set-up appropriate for the application here. The process of setting up the model involves simulating three different case studies of particular relevance to Victoria for a region deemed as of high-interest by the stakeholders. These cases studies will be investigated using relevant parameter schemes for (at least) the Boundary layer, convective processes (for the coarser nested domains), and micro-physics, giving a 12 member ensemble for 3 case studies. Results from the case study will be written up in a technical report at the end of the first project year.
Activity 1. Description	WRF (Weather Research and Forecasting) model set-up, e.g. identify model domain (space and time) and estimate of computing effort at the National Computing Infrastructure (NCI) machines. Prepare input-data, prepare scripts for model runs and data transfers.
Activity 1. Methodology	Review of relevant peer review literature and discussions with relevant colleagues at CSIRO and BoM. Use pre-processing software to derive relevant input fields for WRF. Update and modify existing run and data transfer scripts. Install and compile updated version of WRF on NCI.
Activity 1. Deliverables	A working model configuration of WRF.
Activity 1. Outcomes	This work will enable testing of relevant parameter schemes and other model testing activities relevant for this project.
Activity 2. Description	Update topographic information and if relevant/possible land-surface scheme (the default data set it too coarse for proposed high-resolution experiments).

Activity 2. Methodology	Source and update default topographic information in WRF.
Activity 2. Deliverables	A contribution to the Program Annual Research Report describing the model set-up.
Activity 2. Outcomes	This work will enable testing of relevant parameter schemes for this project
Activity 3. Description	Sensitivity tests of most relevant boundary schemes and micro-physics schemes. A case study region and specific weather events will form a test-bed for the WRF simulations. Region and events will be decided upon in discussion with stakeholders.
Activity 3. Methodology	Generate ensemble of WRF simulations testing identified parameter schemes identified as most suitable for high-resolution application. Evaluate skill of individual ensemble members.
Activity 3. Deliverables	A technical report submitted to the Water for a Healthy Country report series, detailing model experiments and its outcomes.
Activity 3. Outcomes	This work will provide a WRF configuration that can be used (in subsequent years of the Program) for executing convective-resolving experiments within this project.

BI, D. & MARSLAND, S. 2010. **Australian Climate Ocean Model (AusCOM) Users Guide**. *CAWCR Technical Report.*

KENDON, E. J., ROBERTS, N. M., SENIOR, C. A. & ROBERTS, M. J. 2012. Realism of Rainfall in a Very High-Resolution Regional Climate Model. *Journal of Climate*, 25.

MCGREGOR, J. L. & DIX, M. R. 2008. An updated description of the Conformal-Cubic atmospheric model. *High Resolution Numerical Modelling of the Atmosphere and Ocean*.

SKAMAROCK, W. C. & KLEMP, J. B. 2008. A time-split nonhydrostatic atmospheric model for weather research and forecasting applications. *Journal of Computational Physics,* 227**,** 3465-3485.