

Victorian Climate Initiative
PROJECT WORKPLAN
21 May 2013 – 20 May 2014

1. Project Definition

Project ID	VicCI - Project 2
Project Title	Understanding the Mean Meridional Circulation (MMC) and its relevance to Victoria
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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	7 Sept 2013
2	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
3	Draft Annual Work plan for next year	Work plan accepted by Project Management Committee to be recommended to the SC	21 Apr 2014
4	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	Project Annual Research Report accepted by Project Management Committee for incorporation into overall Program Annual Research Report to be submitted to the Steering Committee.	1 May 2014
5	Paper investigating methods to compute regional measure of the Meridional Circulation and detailing trends for the Australian sector	Draft paper forwarded to the Project Management Committee	1 May 2014
6	Progress toward a better understanding of the connections between the various elements of the Hadley Circulation.	A contribution made to the Program Annual Research Report and endorsed by the Project Management Committee	1 May 2014

2. Project Details

Introduction:	The work in SEACI indicates that the recent expansion of the Hadley circulation (HC) (a key component of the mean meridional circulation) has been relatively greater over Australia compared to the rest of the southern hemisphere. And, importantly, the seasonality of the expansion varies between different analyses, with calculations/simulations of the overturning circulation suggesting a summer/autumn expansion but in situ radiosonde observations showing little seasonality. The seasonality of the expansion (greatest in summer and autumn) bears on the issue of what is driving the expansion and on understanding the observed autumnal rainfall decline and how rainfall may respond to future changes.
Activity 1. Description	Develop and adapt existing methods to evaluate the HC from a regional perspective and apply to re-analyses.
Activity 1. Methodology	Develop an approach to investigate the variation in longitude in the HC based on computing the velocity potential and which allows looking at the HC in any longitude band within the southern hemisphere. It will allow (1) diagnosing the specific behaviour of the HC in Australian sector and (2) a comparison of our results for the Australian sector with a different approach (developed by Monash University which also has the ability to depict longitudinal variability) using decomposition of the stream function into a meridional and zonal component - in effect diagnosing the characteristics of HC and the Walker Circulation. The velocity potential approach to be developed will be applied to ERA-interim reanalyses and other re-analyses data sets as appropriate.
Activity 1. Deliverables	A paper investigating the methods for evaluating the HC, detailing the trends for the Australian sector for the post-satellite era and contrasting these trends with previous results obtained for the southern hemisphere.
Activity 1. Outcomes	An improved understanding of the changes in HC which are relevant to Victorian climate and more broadly to sub-tropical southern Australia. (NB: in subsequent years this will be pursued further by investigating the role of the Australian landmass as a possible contributor to the differences between the HC changes in the Australian sector versus the hemispheric changes).
Activity 2. Description	Evaluate the relationships between HC metrics and other metrics (tropopause heights, sub-tropical and extra-tropical wind jets) using reanalyses.
Activity 2. Methodology	A method has been developed in the Earth System Modelling team within CAWCR to evaluate climate models ability to reproduce jet streams. The method identifies jets position based on a centre of mass calculation. The method applied to reanalyses will allow to investigate how the jets positions and intensities relates to other HC indicators used in the past (extend and intensity both globally using the stream function computation or regionally using the velocity potential approach to be developed as part of Activity 1 as well as the tropopause height diagnostics developed in the past). Combining all these calculations will provide a perspective on how key component of the Mean Meridional Circulation are observed to change for both the entire southern hemisphere as well as the Australian sector.
Activity 2. Deliverables	Progress toward a better understanding of the covariance of various elements of the HC (circulation indices, tropopause heights, wind jets) with a view to delivering a paper in the following Program year.

Activity 2. Outcomes	An improved understanding of the changes affecting the various key aspects of the HC. It will provide an improved scientific perspective on the mechanisms of the large-scale changes which are relevant to Victorian climate and more broadly to sub-tropical southern Australia.
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