

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

**1. Project Definition**

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| <b>Project ID</b>     | VicCI - Project 3  |
| <b>Project Title</b>  | Understanding subtropical-extratropical interactions and their relevance to Victoria                               |
| <b>Project Leader</b> | Name: Harry H Hendon CAWCR/BoM<br>Contact: 03 9669 4120 email: <a href="mailto:h hh@bom.gov.au">hhh@bom.gov.au</a> |

| 2013 | Milestone   | Achievement Criteria   | Due date    |
|------|---|--|-------------|
| 1    | Six-monthly progress report including<br>(1) Progress against deliverables,<br>(2) Research effort over the period,<br>(3) Science achievements,<br>(4) Publications/presentations,<br>(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    | Software code to compute Mean Meridional Circulation providing an isentropic view of the circulation  | Results of the computation based on ERA-I presented in the annual project report   | 1 May 2014  |
| 6    | Scientific paper on mechanism and predictability of SAM due to association with ENSO  | Paper submitted and accepted for publication   | 1 Dec 2013  |

## 2. Project Details

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| <b>Introduction:</b>            | <p>Evidence is emerging that variations in extratropical circulation associated with the Southern Annular Mode (SAM) play a significant role in driving variations of the Hadley circulation, and especially rainfall on the poleward edge of the Hadley circulation: High SAM (i.e. a poleward shifted mid-latitude jet) is associated with an expanded Hadley Cell (HC) and increased rainfall in subtropical latitudes in summer. This relationship, which is primarily a summer time phenomenon, is captured in climate models to varying degrees. It is especially associated with ozone depletion, but increased CO<sub>2</sub> is also known to drive SAM to its high phase. Understanding the cause of this relationship between SAM and the HC is crucial to understanding the behaviour of the HC in the future. It furthermore bears on the ability to predict regional climate seasonally. In addition to forcing by greenhouse gases and ozone depletion, there is strong evidence that tropical SSTs during ENSO directly affect the HC, which then affects the SAM (e.g., the HC contracts toward the equator during El Niño thereby resulting in a shift toward low SAM). These variations should be highly predictable. But, SAM is primarily an internal mode of variability. So, the limits of predictability of HC variations will be set by the degree that the internal variations of the SAM determine the poleward extent of the HC.</p> |
| <b>Activity 1. Description</b>  | <p>Use the isentropic analysis of the Mean Meridional Circulation (MMC) to provide a synthetic view of the sub-tropical extra-tropical interactions within the MMC.</p>  |
| <b>Activity 1. Methodology</b>  | <p>Develop a methodology using the isentropic referential to compute the MMC in the ERA-interim reanalyses. Compare that perspective with the classical view using the stream function. Evaluate inter-annual variability and climatic trends.</p>   |
| <b>Activity 1. Deliverables</b> | <p>New software code to do the computation and a contribution to the Project Annual Research Report on the results obtained so far using the ERA-interim reanalyses.</p>   |
| <b>Activity 1. Outcomes</b>     | <p>A newer perspective on the changes in MMC which will provide a different perspective on the sub-tropical extra-tropical interactions which are critical to understand the broader MMC (beside the main HC) impact on Victorian climate.</p>   |
| <b>Activity 2. Description</b>  | <p>Investigate relationship between SAM variability and ENSO.</p>  |
| <b>Activity 2. Methodology</b>  | <p>Using reanalyses and POAMA hindcasts investigate the relationship of seasonal SAM anomalies and tropical SST, especially those associated with ENSO, and documents the seasonal predictability.</p>   |
| <b>Activity 2. Deliverables</b> | <p>Scientific paper on the mechanism for the interaction of the SAM with tropical SST variations and the predictability of SAM variations due to association with ENSO.</p>  |
| <b>Activity 2. Outcomes</b>     | <p>New insights into tropical forcing of extratropical circulation and predictability of climate in eastern Australia (including Victoria), especially due to variations of the SAM that have previously been assumed to be unpredictable.</p>   |