

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

1. Project Definition

Project ID	VicCI - Project 4
Project Title	Evaluation of climate model simulations of current trends in order to attribute observed trends
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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 submitted comparing the northern and southern hemisphere tropical expansion.	Draft paper forwarded to the Project Management Committee	1 May 2014
6	Progress toward an attribution of the observed tropical expansion to individual climate forcings	A contribution made to the Program Annual Research Report report and accepted by the Project Management Committee	1 May 2014
7	A paper describing the role of anthropogenic forcings in the observed changes of the HC.	Draft paper forwarded to the Project Management Committee	1 May 2014

2. Project Details

Introduction:	Climate model simulations best represent observed recent changes in the mean meridional circulation (MMC), especially its expansion, when ozone depletion and other anthropogenic external forcings are used, suggesting at least a partial human influence on recent changes. However, the expansion in the models is typically much weaker when compared to observations. Stratospheric ozone depletion, often poorly represented in GCMs, may play a significant role in the southern hemisphere circulation, including the tropics and subtropics. It is thus critical to understand what is actually driving the changes in the MMC and why the models are underestimating the changes.
Activity 1. Description	Comparison of tropical expansion in the Northern (NH) and Southern hemispheres (SH).
Activity 1. Methodology	Application of the methodologies developed in SEACI2 for characterising tropical expansion (using radiosonde data and detecting trends in changes in tropopause heights (which are indicative of changes in the width of the tropics)) to northern hemisphere radiosonde data. The purpose of this extension away from the southern hemisphere (results published last year) is to estimate the regional and global variability and trends in tropical expansion between the hemispheres across the annual cycle. This is important to document as it expected that the different external forcings should not have the same signature in both hemispheres.
Activity 1. Deliverables	Paper submitted detailing the NH tropical expansion over both the whole globe and individual regions, comparing with SH to help identify the processes relevant to each hemisphere's expansion.
Activity 1. Outcomes	An improved understanding of the relative roles of the various processes that influence the edge of the tropics on regional and global scales in both hemispheres.
Activity 2. Description	Attribute the relative roles of individual climate forcings in the observed tropical expansion.
Activity 2. Methodology	<p>A two prong approach is to be used: 1) a regression analysis relating hypothesized climate drivers, such as greenhouse gases, stratospheric ozone and aerosols, and observed tropical expansion and 2) a verification of the observations based results using 'single forcing' GCM experiments with the CCSM4 global climate model (on-going collaboration).</p> <p>(NB: This is an extensive analysis difficult to apply across many models and hence the focus has been put on a single model from which an extensive dataset is available: three member ensembles with either greenhouses gases or stratospheric ozone or aerosols or natural forcings alone as well as from a 3 member ensemble with all forcings combined (15 simulations in total). It will be possible in subsequent years to extend that work if warranted to other models, in particular the ACCESS model, although the data are not available at this stage).</p>
Activity 2. Deliverables	Preparation of a paper for submission that details the results of the statistical analysis and the results of the simulations.
Activity 2. Outcomes	A quantification of the relative roles of the factors that are hypothesized to drive tropical expansion. This knowledge will help refine projections for future impacts of tropical expansion that are relevant to Victorian climate.

Activity 3. Description	Analyse Hadley Circulation changes in a large set of simulations of current climate with anthropogenic and natural external forcings with as many as possible model simulations from the CMIP5 dataset.
Activity 3. Methodology	Apply the stream functions approach to compute the zonal mean hemispheric Hadley Circulation (HC) intensity and extend this analysis across a large number of state-of-the-art models to complement the SEACI2 findings which were based on only two models (CCSM3 from the CMIP3 dataset and the CSIRO-Mk3.6 from the CMIP5 dataset for which model results were inconclusive and appear problematic).
Activity 3. Deliverables	A paper describing the results and drawing conclusions about the anthropogenic contribution to the observed changes in HC relevant to southern Australian climate.
Activity 3. Outcomes	The analysis of a larger number of models will provide a more robust perspective on the part of the large-scale hemispheric HC which can be attributed to anthropogenic forcings.