

## The Climate and Weather Science Laboratory

<b>Document Title</b>	<b>Use Cases for Work Package 1</b>
<b>Work Package No. and Title</b>	WP1 - ACCESS Simulation and Modelling
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<b>Work Package Description</b>	<p>Within the Climate and Weather Science Laboratory, the ACCESS Simulation and Modelling work package is to build, enhance and integrate ACCESS modelling infrastructure for the preparation and run of coupled and uncoupled model experiments.</p> <p>This document describes the use cases of the work package to support the science community's needs and goals within a framework designed for reproducibility, ease-of-use, support, and the sharing of code, data and experiments.</p>

### Revision history

<b>Date</b>	<b>Version</b>	<b>Description</b>	<b>Author</b>
16 May 2012	0.1	Initial draft of the use-cases for work package 1	Dix
21 August 2012	0.2	Add simpler use cases	Dix
19 Sept 2012	0.3		Dix

### Release history

<b>Date</b>	<b>Version</b>	<b>Status</b>	<b>Audience</b>	<b>Approval</b>
25 July 2012	0.1	Development draft	Work Package Leaders	Dix

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**Table 1 WP1-U1 Reproducing a standard experiment**

<b>Use Case ID</b>	<b>WP1-U1: Reproducing a standard experiment</b>
<b>Scope</b>	ACCESS standard experiment
<b>Primary Actor</b>	Climate Modeler (new to ACCESS environment)
<b>Priority</b>	High: NeCTAR Acceptance Criteria in phase 1,2,3
<b>User/Project</b>	IPCC AR5 and CMIP5 simulation experiments
<b>Goal in Context</b>	Reproduce results from a validated standard experiment
<b>Workflow/Process (Outline of steps)</b>	<p>Process to reproduce validated standard experiment.</p> <ol style="list-style-type: none"> <li>1. Researcher searches list of standard atmospheric model experiments in virtual lab documentation and chooses one of interest</li> <li>2. Finds selected experiment via model user interface</li> <li>3. Copies experiment and runs test case (model executable and all input data from standard shared locations)</li> <li>4. Checks results against archived output</li> </ol>
<b>Requirements</b>	<p>List of systems required:</p> <ul style="list-style-type: none"> <li>• ACCESS standard experiment library</li> <li>• ACCESS coupled model experiment database</li> <li>• Ancillary data, tools and workflows</li> <li>• Coupled model user interface</li> <li>• Coupled model simulation workflow</li> <li>• Model analysis tools and workflows (user or community provided)</li> </ul>
<b>Dependencies</b>	<p>List of external dependencies:</p> <ul style="list-style-type: none"> <li>• NCI – User authentication and project registry service</li> <li>• NCI - File system for user and project files</li> <li>• NCI - HPC system and job scheduler</li> </ul>
<b>Extensions and Variations</b>	<p>Supported experiments will include</p> <ul style="list-style-type: none"> <li>• ACCESS 1.0 and 1.3 AMIP configurations</li> <li>• ACCESS 1.0 and 1.3 single column model</li> <li>• Transpose AMIP or seasonal prediction (run of days to weeks from observed initial state)</li> <li>• Met Office GA4.0 AMIP configuration</li> </ul>

Table 2 WP1-U2 Modifying a standard experiment

<b>Use Case ID</b>	<b>WP1-U2: Modifying a standard experiment</b>
<b>Scope</b>	Summary of ACCESS modified standard experiment
<b>Primary Actor</b>	Climate Modeler
<b>Priority</b>	High: NeCTAR Acceptance Criteria in phase 1,2,3
<b>User/Project</b>	IPCC AR5 and CMIP5 simulation experiments
<b>Goal in Context</b>	Reproduce results from a validated standard experiment
<b>Workflow/Process (Outline of steps)</b>	<p>Process to modify a standard experiment.</p> <ol style="list-style-type: none"> <li>1. Researcher searches list of standard experiments in virtual lab documentation and chooses one of interest</li> <li>2. Finds selected experiment via model user interface</li> <li>3. Copies experiment</li> <li>4. One or more of the following (in increasing order of sophistication) <ul style="list-style-type: none"> <li>• Requests an additional model diagnostic</li> <li>• Changes a model physics option</li> <li>• Selects an alternate ancillary file</li> <li>• Modifies an existing ancillary file</li> <li>• Checks out model code from repository, modifies code and rebuilds model</li> </ul> </li> <li>5. Runs model</li> <li>6. Checks results against archived output and analyses impact of the change</li> </ol>
<b>Requirements</b>	<p>List of systems required:</p> <ul style="list-style-type: none"> <li>• ACCESS standard experiment library</li> <li>• ACCESS coupled model code repository</li> <li>• ACCESS coupled model experiment database</li> <li>• Ancillary data, tools and workflows</li> <li>• Coupled model user interface</li> <li>• Coupled model build workflow</li> <li>• Coupled model simulation workflow</li> <li>• Model analysis tools and workflows</li> </ul>
<b>Dependencies</b>	<p>List of external dependencies:</p> <ul style="list-style-type: none"> <li>• NCI - User authentication and project registry service</li> <li>• NCI - File system for user and project files</li> <li>• NCI - HPC system and job scheduler</li> </ul>
<b>Extensions and Variations</b>	<ul style="list-style-type: none"> <li>•</li> </ul>

Table 3 WP1-U3 Testing a climate hypothesis

Use Case ID	WP1-U3: Testing a Climate Hypothesis
Scope	New ACCESS coupled climate simulation experiment
Primary Actor	Coupled Climate Modeler
Priority	High: NeCTAR Acceptance Criteria in phase 1,2,3
User/Project	IPCC AR5 and CMIP5 simulation experiments
Goal in Context	Perform a climate simulation experiment starting from a validated standard experiment
Workflow/Process (Outline of steps)	<p>Process to perform a climate simulation experiment starting from a validated standard experiment.</p> <ol style="list-style-type: none"> <li>1. Researcher forms hypothesis</li> <li>2. Tests using CMIP5 data from ESG</li> <li>3. Thinks of model experiment to further test idea</li> <li>4. Selects ACCESS CMIP5 standard experiment (ACCESS1.0 or 1.3) as a starting point <ul style="list-style-type: none"> <li>• Runs test case and checks against archived output</li> </ul> </li> <li>5. Modifies code/data appropriately. E.g., one or more of the following possible changes <ul style="list-style-type: none"> <li>• Change model forcing (through UI choices or specification of alternate ancillary files)</li> <li>• Creates a modified branch in code repository</li> <li>• Uses standard tools to modify ancillary files</li> </ul> </li> <li>6. Uses coupled model UI to build model and control experiment</li> <li>7. Runs experiment with data appearing in CMIP5 form in some ESG like catalogue <ul style="list-style-type: none"> <li>• Metadata includes details of code branches and ancillary files</li> </ul> </li> <li>8. Analysis using same tools as in step 2.</li> <li>9. Publish data to some more permanent storage or go back to step 5</li> </ol>
Requirements	<p>List of systems required:</p> <ul style="list-style-type: none"> <li>• ACCESS CMIP5 standard experiment library</li> <li>• ACCESS coupled model code repository</li> <li>• ACCESS coupled model experiment database</li> <li>• Ancillary data, tools and workflows</li> <li>• Coupled model user interface</li> <li>• Coupled model build workflow</li> <li>• Coupled model simulation workflow</li> <li>• Model analysis tools and workflows</li> <li>• Publish experiment data products to permanent storage</li> </ul>
Dependencies	<p>List of external dependencies:</p> <ul style="list-style-type: none"> <li>• WP3 - data catalogue and access services</li> <li>• RSDI - CMIP5 data archive and catalogue</li> <li>• NCI – User authentication and project registry service</li> <li>• NCI - File system for user and project files</li> <li>• NCI - HPC system and job scheduler</li> <li>• WP3 – publish data products to Project/RDSI storage</li> </ul>

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<b>Extensions and Variations</b>	List of variations: Uncoupled Climate Simulation Experiments <ul style="list-style-type: none"><li>• ACCESS Atmospheric Climate Simulation</li><li>• ACCESS Ocean Climate Simulation</li></ul>
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Table 4 WP1-U4 Global NWP simulation

<b>Use Case ID</b>	<b>WP1-U4: Global NWP simulation</b>
<b>Scope</b>	Summary of global NWP simulation
<b>Primary Actor</b>	Atmospheric Weather Modeller
<b>Priority</b>	High: NeCTAR Acceptance Criteria in phase 1,2,3
<b>User/Project</b>	CAWCR Numerical Weather Prediction
<b>Goal in Context</b>	Perform a global weather simulation experiment starting from an existing global analysis.
<b>Workflow/Process (Outline of steps)</b>	<p>Process to perform a global weather forecast simulation experiment.</p> <ol style="list-style-type: none"> <li>1. Select current ACCESS APSn global configuration from database of supported experiments.</li> <li>2. Choose starting date and modify experiment to use ERA interim data for that date.</li> <li>3. Run model</li> <li>4. Compare forecast to ERA analyses</li> </ol>
<b>Requirements</b>	<p>List of systems required:</p> <ul style="list-style-type: none"> <li>• ACCESS UM model experiment database</li> <li>• Ancillary data, tools and workflows</li> <li>• UM model user interface</li> <li>• UM model simulation workflow</li> <li>• Model analysis tools and workflows</li> </ul>
<b>Dependencies</b>	<p>List of external dependencies:</p> <ul style="list-style-type: none"> <li>• WP3 - data catalogue and access services</li> <li>• NCI - User authentication and project registry service</li> <li>• NCI - File system for user and project files</li> <li>• NCI - HPC system and job scheduler</li> <li>• WP3 - publish data products to Project/RDSI storage</li> </ul>
<b>Extensions and Variations</b>	<p>List of variations:</p> <ul style="list-style-type: none"> <li>• Start from archived BOM analysis for selected date.</li> <li>• Compare results to BOM analyses and/or forecasts</li> </ul>

Table 5 WP1-U5 Investigating an extreme weather event

Use Case ID	WP1-U5: Investigating an Extreme Weather Event
Scope	Summary of extreme weather simulation experiment
Primary Actor	Atmospheric Weather Modeller
Priority	High: NeCTAR Acceptance Criteria in phase 1,2,3
User/Project	CAWCR Numerical Weather Prediction
Goal in Context	Perform a high-resolution weather simulation experiment starting from an existing regional analysis and forecast product.
Workflow/Process (Outline of steps)	<p>Process to perform a high-resolution weather forecast simulation experiment nested (one-way) in a regional analysis and forecast product.</p> <ol style="list-style-type: none"> <li>1. Researcher interested in particular extreme weather event</li> <li>2. Initial analysis using BOM Australian region analysis and forecast products</li> <li>3. Decides to investigate simulation sensitivity to grid resolution</li> <li>4. Selects relocatable model experiment as a starting point <ul style="list-style-type: none"> <li>• Builds a grid with specific grid resolution</li> <li>• Runs and checks against archived output</li> </ul> </li> <li>5. Reruns Australian regional model from archived initial conditions and lateral boundary conditions to generate specific LBCs for high resolution model <ul style="list-style-type: none"> <li>• Files obtained via catalogue w/o knowing details of file system or archive</li> </ul> </li> <li>6. Runs high resolution model (version of ACCESS-C or 1.5 km relocatable)</li> <li>7. archives and analyses model forecast results</li> </ol>
Requirements	<p>List of systems required:</p> <ul style="list-style-type: none"> <li>• ACCESS regional forecast data products</li> <li>• ACCESS UM model code repository</li> <li>• ACCESS UM model experiment database</li> <li>• Ancillary data, tools and workflows</li> <li>• UM model user interface</li> <li>• UM model build workflow</li> <li>• UM model simulation workflow</li> <li>• Model analysis tools and workflows</li> <li>• Publish experiment data products to permanent storage</li> </ul>
Dependencies	<p>List of external dependencies:</p> <ul style="list-style-type: none"> <li>• WP3 - data catalogue and access services</li> <li>• NCI – User authentication and project registry service</li> <li>• NCI - File system for user and project files</li> <li>• NCI - HPC system and job scheduler</li> <li>• WP3 – publish data products to Project/RDSI storage</li> </ul>
Extensions and Variations	<p>List of variations:</p> <ul style="list-style-type: none"> <li>• Comparison with observations from BOM archive?</li> </ul>

Table 6 WP1-U7 Prototype ACCESS2 simulation

<b>Use Case ID</b>	<b>WP1-U7: Testing ACCESS2 prototype</b>
<b>Scope</b>	Testing a development version of ACCESS2
<b>Primary Actor</b>	Experienced Coupled Climate Modeler
<b>Priority</b>	Medium: NeCTAR Acceptance Criteria in phase 3
<b>User/Project</b>	Model development
<b>Goal in Context</b>	Perform a test simulation with a new model version
<b>Workflow/Process (Outline of steps)</b>	<p>Process to perform a test climate simulation experiment with a prototype model</p> <ol style="list-style-type: none"> <li>1. Builds model components with code from Experiment configured using coupled model</li> <li>2. Runs experiment with data appearing in CMIP5 form in some ESG like catalogue <ul style="list-style-type: none"> <li>• Metadata includes details of code branches and ancillary files</li> </ul> </li> <li>3. Runs standard model evaluation analysis</li> </ol>
<b>Requirements</b>	<p>List of systems required:</p> <ul style="list-style-type: none"> <li>• ACCESS coupled model code repository</li> <li>• ACCESS coupled model experiment database</li> <li>• Ancillary data, tools and workflows</li> <li>• Coupled model user interface</li> <li>• Coupled model build workflow</li> <li>• Coupled model simulation workflow</li> <li>• Model analysis tools and workflows</li> </ul>
<b>Dependencies</b>	<p>List of external dependencies:</p> <ul style="list-style-type: none"> <li>• WP3 - data catalogue and access services</li> <li>• RSDI - CMIP5 data archive and catalogue</li> <li>• NCI – User authentication and project registry service</li> <li>• NCI - File system for user and project files</li> <li>• NCI - HPC system and job scheduler</li> <li>• WP3 – publish data products to Project/RDSI storage</li> </ul>
<b>Extensions and Variations</b>	<p>List of variations: Uncoupled Climate Simulation Experiments</p> <ul style="list-style-type: none"> <li>• ACCESS2 Atmospheric Climate Simulation</li> <li>• ACCESS2 Ocean Climate Simulation</li> <li>• Current Met Office GAd atmospheric configurations (likely GAd5.0 ENDGAME)</li> </ul>



