

Simulation and Prediction for the Indo-Pacific (Debbie Hudson, Harun Rashid)

- Addressing key model biases (atmosphere and ocean)
- Sensitivity to convection schemes (e.g., Comorph) and other parameterisations
- Modelling the Indonesian Throughflow and Maritime continent regions
- Teleconnections between the Indian and Pacific (ocean and atmosphere) and to Australian climate
- Types of modelling experiments (e.g., nudging)
- Evaluation approaches, error diagnostics and data

Key questions

- What research are you planning or would like to do that uses ACCESS?
- In what ways do you use ACCESS?
- What would make ACCESS easier to use?
- What are barriers to using ACCESS for you?

List of ideas for tasks that the NRI could undertake. Categorise by

- Short (<1 year), Medium (1-2 year) and Long (2-5 years)

and by Afternoon group (based around *potential NRI teams*)

- 'Atmosphere': related to the atmosphere model component, including chemistry
- 'Ocean': related to the ocean and sea-ice components, including ocean biogeochemistry
- 'Land': related to the land component including land biogeochemistry
- 'DA': related to data assimilation infrastructure across any model component
- 'Software': related to new software techniques including Next Generation Modelling System (NGMS)
- 'Coupled': related to coupled model configurations
- 'User': anything that supports user engagement with ACCESS (training, data access, communication, website, ...)

Indo-Pacific Group

	Idea	Short (< 1 year) Medium (1-2 yr) Long (2-5 yr)	NRI team
1	Implementation and support latest versions of key ACCESS coupled (and component) model configurations (e.g., UM-Nemo GCx; UM-MOM CM, ESM; GFDL-MOM)	Medium	Coupled
2	Well documented standard experiment/run configurations - that give instructions on how to configure and run and include test data	Medium	Coupled
3	Support for flexible (e.g., regional, flexible resolution, partial coupling, pacemaker, nudging) configurations (atmos, ocean, coupled) and well documented (e.g., need to consider boundary conditions and how to modify eg. change forcing, boundary conditions, namelist params....). Have tutorial documented use-case. (For example, lots of different configurations built around a single use-case. Would be beneficial to have a use-case focused on Indo-Pacific).	Long	Coupled
4	Settling on a common location for code, issues, knowledge hub/recommendations, open communication, collaboration, up-to-date wiki's, community support (like having <i>everything</i> publicly available on github, e.g., COSIMA experience).	Short	User
5	Training sessions on how to configure and run the coupled and ESM models	Medium	Coupled
6	Support for research ideas -- flexible -- e.g. infrastructure to run a particular model config (e.g., regional model) with all supporting data -- custom configurations (rather than off-the-shelf).	Long	Coupled
7	Clear tutorials hosted online - step-by-step walk through of standard configs.	Medium	User
8	Support for taking a standard configuration and tailoring it to a particular use-case	Long	Coupled
9	Central knowledge hub of key recommendations of different configurations and e.g., physics; model biases	Medium	User
10	Support for Rose/Cylc (including documentation, training)	Short	Software

These are repeated ideas from previous table, but targeted to other key NRI teams for their consideration

	Idea	Short (< 1 year) Medium (1-2 yr) Long (2-5 yr)	NRI team
	Well documented standard experiment/run configurations - that give instructions on how to configure and run and include test data	Medium	Atmosphere
	Well documented standard experiment/run configurations - that give instructions on how to configure and run and include test data	Medium	Ocean
	Support for flexible (e.g., regional, flexible resolution and partial coupling or pacemaker, flexible region, nudging) configurations (atmos, ocean, coupled) and well documented (e.g., need to consider boundary conditions and how to modify eg. change forcing, boundary conditions, namelist params....). Have tutorial documented use-case. (For example, lots of different configurations built around a single use-case. Would be beneficial to have a use-case focused on Indo-Pacific.	Long	Atmosphere
	Support for flexible (e.g., regional, flexible resolution and partial coupling or pacemaker, flexible region, nudging) configurations (atmos, ocean, coupled) and well documented (e.g., need to consider boundary conditions and how to modify eg. change forcing, boundary conditions, namelist params....). Have tutorial documented use-case. (For example, lots of different configurations built around a single use-case. Would be beneficial to have a use-case focused on Indo-Pacific.	Long	Ocean
	Support for research ideas -- flexible -- e.g. infrastructure to run a particular model config (e.g., regional model) with all supporting data -- custom configurations (rather than off-the-shelf).	Long	Atmosphere
	Support for research ideas -- flexible -- e.g. infrastructure to run a particular model config (e.g., regional model) with all supporting data -- custom configurations (rather than off-the-shelf).	Long	Ocean
	Clear tutorials hosted online - step-by-step walk through of standard configs.	Medium	Atmosphere
	Clear tutorials hosted online - step-by-step walk through of standard configs.	Medium	Ocean
	Clear tutorials hosted online - step-by-step walk through of standard configs.	Medium	Coupled
	Support for taking a standard configuration and tailoring it to a particular use-case	Long	Atmosphere
	Support for taking a standard configuration and tailoring it to a particular use-case	Long	Ocean

What research are you planning or would like to do that uses ACCESS?

- Run coupled global NWP experiments (e.g. compare GC4 and GC5)
- Evaluate option of extending coupled NWP out to multi-week (same system)
- Evaluate new physics parameterisations (e.g., CoMorph) – impact on forecasts
- Run seasonal (ACCESS-S) forecast experiments to assess contribution of ocean/atmos initial conditions
- Perform atmosphere/ocean/coupled model experiments by changing (for example):
 - Model resolutions
 - Boundary and/or climate forcing
 - Model code
- Use ACCESS-ESM for experiments/output analyses
- Run pace maker experiments
- Run decadal forecast experiments
- AMIP simulations e.g., to compare to coupled simulations to look at benefits of coupling
- Calculation of slowly varying diagnostics of atmosphere, specifically background state.
- From observational data provide guidance/input to improve systematic model biases
- Capability to run high-resolution coupled *regional* nests.
- Impact of ocean mixing parameterisation for tropical pacific - need regional configurations; partial coupling experiments (e.g. filter SST, nudging experiments)
- Regional processes and coupling feedbacks

In what ways do you use ACCESS?

- Running a coupled reanalysis for purposes of initial conditions for multi-week/seasonal prediction
- Running hindcasts to evaluate seasonal (ACCESS-S) prediction performance and calibrate/bias-correct real-time forecasts
- Running initialised experiments (ACCESS-S hindcast mode) to evaluate impact of initial conditions/model change
- Running AMIP simulations (comparison to the coupled simulation)
- Run coupled NWP case studies to evaluate performance
- Conduct mechanistic experiments with ACCESS (CM or ESM) and/or its component models
- Analysis of publicly available outputs

What would make ACCESS easier to use?

- Implementation and access to latest model configurations
- Access to required ancillary data
- Instructions and support for running the forecast/prediction suites for experiments (e.g., seasonal forecast suite)
- Training sessions on how to configure and run the coupled and ESM models, and analyse their outputs
- Written documentations
- Support for required post-processing utilities (e.g. a common repository for things like um2netcdf.py and tracking of different stash files)
- Up to date and supported libraries for building the latest model configurations (for all model components)
- Supported suites for experiments (i.e. suites already ported from the Met Office and ready to use)
- Test data (input and output) for validating the suite
- Model output in more analysis-ready format (e.g.: current ACCESS-S2 research dataset on NCI)
- Version controlled code-base for typical set of Extraction, Transformation, and Loading (ETL) workflows leading to less friction between stored model output and analysis-ready data (ARD)
- Reinforce comments from COSIMA folks - all models pulling from same versions of documented code that is tested under CI
- Support for research ideas -- flexible -- e.g. infrastructure to run a particular model config (e.g., regional model) with all supporting data -- custom configurations (rather than off-the-shelf)
- Setting up standard experiment/run configurations - that give instructions on how to configure and run and include test data
- Modelling system needs to be flexible enough to accommodate different experiments. There is a lot of pain for a researcher to modify a standard configuration
- Support for taking a standard config and tailoring it to a particular use-case would be extremely useful.

What would make ACCESS easier to use? (continued)

- Having a key location for information, Targeted Q&A sessions, up-to-date wiki information, knowing who to ask or look ---- community
- Using something like github to collaborate and for common repositories (e.g., COSIMA experience)
- Support for Rose/Cylc (including documentation, training)
- Support for NEMO, MOM
- Support for regional configurations (atmos, ocean, coupled) and well documented (e.g., need to consider boundary conditions and how to modify). Have tutorial documented use-case. (For example, WRF -- lots of different configurations built around a single use-case. Would be beneficial to have a use-case focused on Indo-Pacific)
- Flexible/unstructured grids - to put the resolution where it matters (and e.g., save on computing)
- Facilitate communication e.g., about key model biases
- Know about key recommendations of different configurations and e.g., physics

What are barriers to using ACCESS for you?

- Complexity of the coupled and ESM versions
- Complexity of the forecast suites (which differ e.g., climate vs coupled NWP) for running experiments
- Computer time
- Interested in running medium to long term experiments (pace maker, climate forcing etc) - but the main challenge is postprocessing
- Being able to configure the model properly
- Getting new version of the model set up (minimal support for coupled versions, NEMO, XIOS etc. at the moment)
- Multiple version control/code repository systems
- Knowledge of Rose/Cylc
- Licencing issues with UM (e.g., cannot use github). Open source would be desirable!