

ACCESS SAG Meeting, 8 March 2006, Bureau, 10AM

Attendance

K. Puri, N. Smith, C. Mitchell, A. Lynch, T. Hirst, YP Wang, P. Steinle, C. Jakob

Members of the Infrastructure group – M. Naughton, M. Dix, A. Sulaiman

Unable to attend: M. England – participated through phone hook-up

Agenda

- Action items from previous meeting
Communication of SAG meetings to the wider community (N. Smith and C. Mitchell)
Couple CABLE with UM (YP Wang to provide)
Couple AusCOM with UM (received from T. Hirst)
- Meeting with Alan Dickinson (MetOffice)
- Issues/Developments
Universities
CSIRO
Bureau
- Report by the Infrastructure group (M. Naughton)
- Any other issues
Resources for ACCESS (K. Puri)
Integrating ACCESS planning with current planning process of individual institutions (C. Jakob)
Questions raised by Peter Hurley on Chemistry and ACCESS
- Next meeting

Action items from previous meeting

Communication of SAG meetings

- No action taken yet; Smith and Mitchell to follow up;
- Jakob, Hirst and Lynch will put up minutes on their web sites;
- Puri will explore setting up an ACCESS website.

Couple CABLE with UM

- Report by YP Wang has been received and is included in Attachment A.

Couple AusCOM with UM

- Report by T. Hirst has been received and is included in Attachment A.

Meeting with Alan Dickinson

Dr. Alan Dickinson (MetOffice) attended the WMO Commission for Atmospheric Sciences (CAS) Session held in Cape Town from 16-24 March as the principal delegate for the UK. This provided a useful opportunity for Neville Smith and myself to have a discussion with him on ACCESS, and in particular on us using the MetOffice Unified Model and 4DVAR. The meeting was positive and the MetOffice was close to finalising the licensing terms for our use of their systems – he expected that a final draft would be agreed to by 15 March. The main criteria in our use of the systems, which in our view are quite reasonable, are (i) they must follow the concept of a level playing field with the competitors, eg data must be available to external customers on the same time and cost level as it is to internal customers; (ii) MetOffice plan to charge for the licence – a nominal figure (~\$40K pounds) to be agreed by both sides was mentioned but this could be waived on the basis of shared development of the model.

In subsequent correspondence both Alan and I agreed that it would be good if I could visit the MetOffice on 27 March after the THORPEX meetings in Reading that I am attending. Some of the key issues that would be discussed are (i) to identify our roadmap and how the MetOffice could help us get there; (ii) to start work on defining the work packages that would enable us to qualify for waiving of the license fee; (iii) to explore wider possibilities for collaboration, and if appropriate to decide how they could be formalised; (iv) to identify people, timelines etc for extended visits, (v) to identify our needs for more formalised (contracted) support either in terms of training or consultancy.

Mitchell noted that G. Ayers and G. Love also plan to visit the MetOffice at the end of March and that it would be good to keep them in the loop.

Issues / Developments

Universities

- Portability of UM to the APAC computer – Puri indicated that the initial priority for ACCESS is to implement the UM on the Bureau/CSIRO HPCCC NEC-SX6 computer. However the universities could work in parallel in implementing the model; they will need to sign a licensing agreement (as the Bureau and CSIRO have done) to use the model for research purposes;
- Flexibility of UM in terms of using a degraded resolution for example – Dix and others noted that the UM does have this flexibility;
- The Network was considering importing WRF for Regional Climate Modelling (RCM) application and had asked for comments before making a commitment. SAG expressed the view ACCESS would not be working with another model and that it would be desirable and preferable if the Universities used the UM for its RCM work. It was pointed out that the UM has been used extensively for RCM work at the MetOffice. It is a non-hydrostatic model and can be run at very high resolutions;

- SAG suggested that it would be useful if the Universities/Network could formally spell-out what components of ACCESS they would be interested in helping develop. There is already some involvement on the land-surface model and the ocean-ice components via AusCOM. However there may be other opportunities and it would be useful if an up-to-date list of modelling capabilities across the University sector could be developed. An indication on how the University sector work in some of the areas identified could be transferred to ACCESS would be useful.

CSIRO

- CSIRO has started new budgetary process this year;
- Most CSIRO climate work sits in the Climate Weather and Ocean Prediction Theme which has secured executive team agreement for extra resources mainly for ACCESS;
- Resources for ACCESS have been included in the ACCSP proposal for 2006/2007 targeted towards the land-surface and ocean;
- 0.5 FTE (P. Hurley) has been allocated for evaluation of MOZART as recommended in the ACCESS Project Plan;
- A version of CABLE will be released for general use at the end of 2006;
- Discussions with the TPAC group indicate (i) there are no substantial technical difficulties foreseen in porting AusCOM to the NEC SX6; (ii) there are no substantial issues with ACCESS using the TPAC sea-ice model. Porting of AusCOM to the SX6 will start in ~3 weeks (D. Bi).

Bureau

- As with CSIRO an ACCSP proposal with emphasis on ACCESS is being prepared;
- BMRC is in the process of starting its forward planning process – ACCESS will be given a high priority in this process.

Report by Infrastructure Group

Group consisted of M. Naughton, M. Dix, A. Sulaiman and P. Steinle. Following discussions at the February meeting of the SAG, the Group was asked address the following issues –

- Assess and provide recommendations on the computing environments required to run ACCESS for the next two years;
- Assess the software environment, including source code maintenance, locally and at the MetOffice, and provide recommendations for the most appropriate environment to be used for ACCESS;
- Develop a map of modelling environment for ACCESS, namely individual modules in ACCESS (atmosphere, ocean), couplers and the linkages between the modules;
- Archiving standards to be used in ACCESS;
- Report on other infrastructure/software issues that the group felt were important;

- Additionally provide a summary on the UM and 4DVAR systems, based on the work done so far.

The Group's report is included as Attachment B. The discussion on the report raised a number follow up actions:

- A number of computing relating issues such as the desirability of an ACCESS development server, firewall access came up. It was agreed that Smith and Mitchell would follow up on these issues;
- The report concentrated on the MetOffice components of ACCESS namely the Unified Model and 4DVAR. It was felt that at some stage it would be desirable to address infrastructure issues related to other components such as the ocean/sea-ice model, CABLE etc;
- C. Jakob supported by key Bureau, CSIRO and University scientists was asked to prepare a roadmap on the implementation and further development atmospheric model, particularly on physical parametrisations.

Other Issues

- Puri noted that lack of dedicated resources for ACCESS were posing serious problems that could impact on the ability to meet key timelines. The UM and 4DVAR systems have been available for a few months but only a limited number of people have been able to work on them on spare time basis only. There is urgent need to appoint Team Leaders and a group of scientists to conduct priority ACCESS work. Both Mitchell and Smith pointed out that the position should improve. As noted above CSIRO have managed to get additional funding and resources for ACCESS have been included in the ACCSP proposal for 2006/2007; similarly BMRC will soon be advertising for two senior positions related to ACCESS (physics and infrastructure) and also have resources for ACCESS in the ACCSP proposal;
- Both Smith and Mitchell emphasised that resources will not be committed based on strategic plans but on a work plan, and that is essential to get the work plan written down for each component of ACCESS clearly stating current status, key issues and level of resources required;
- Smith suggested that future SAG meetings should be more focussed and concentrated on reporting/discussing progress in key components in ACCESS as listed in the minutes of the February SAG meeting;
- P. Hurley had raised an initial list of questions for the SAG on the initiation of a Chemical Transport Modelling Capability for ACCESS (see Attachment C). It was agreed that Puri would contact Hurley and discuss the issues that he has raised. Puri will also contact one of the MOZART partners to enable acquisition of the MOZART system. Further Jakob would also talk to Hurley when preparing the roadmap for the Atmospheric model.

Next SAG meeting

10AM on 5 April at the Bureau

ATTACHMENT A

Implementation Plans for key ACCESS components

1. Implement MetOffice 4DVAR in ACCESS environment (provided by Peter Steinle)

There are several major assumptions, which will prevent the success of this project if they do not hold:

- The appropriate staff will be available.
 - There are key tasks requiring highly specialized skills and expertise. It is therefore not just a matter of assigning sufficient resources, but also assigning the most appropriate staff to ensure that the tasks are completed within the rather tight timeframe.
- The acquisition of new satellite data for global and regional NWP will be arranged.
 - The ability to use new satellite sensors was identified as one of the main reasons for ACCESS using the VAR assimilation scheme. Without access to the new data there is little point in pursuing this strategy.

Notation

Date: Quarter and year (Q2/2006 being April-June 2006)

Dep: Dependencies on other tasks

Doc: Is documentation to be prepared ?

Staff: Estimated staff resources. If there is clearly a person best suited to this, they are suggested. Otherwise generic reference to programmer (ito) or scientist (sci) is given.

| Date | | Task | Dep | Doc | Staff |
|---------|----|---|----------|-----|-------------|
| Q2/2006 | A1 | Observation database (ODB) software installed on TX7/SX6 | | Y | TTL + HPCCC |
| | A2 | Populate ODB with current BoM observation (ongoing) | A1 | | TTL |
| | A3 | Interface ODB and Observation Processing System (OPS) [modify OPS & VAR code and scripts etc.] | A1 | Y | YIX |
| | A4 | Implement VARUI for global and regional NWP | A2 A3 | | ito |
| | A5 | Implement UMUI for global and regional NWP | A2 A3 | | ito |

| Date | | Task | Dep | Doc | Staff |
|---------|----|--|-----|-----|--------------|
| Q3/2006 | B1 | Develop observation monitoring (6 months) | A4 | Y | YIX + sci(*) |
| | B2 | Interface model diagnostics (MetVIEW) | A4 | | ito + sci |
| | B3 | Benchmark computing requirements for 3dVAR & 4dVAR; | A4 | Y | ILIA |
| | B4 | Initial determination of likely configurations | B3 | | sci |
| | B5 | Optimization of ODB to support extended satellite data usage (12 months) | A3 | | TTL &HPCCC |

(*) Half of PXS and RSS

| Q4/2006 | | Task | Dep | Doc | Staff |
|---------|----|--|--------|-----|---------------|
| Q4/2006 | B1 | Continue obs monitoring development | A4 | Y | YIX+sci(*) |
| | B5 | Optimization of ODB to support extended satellite data usage (12 months) | A3 | Y | TTL &HPCCC |
| | C1 | Optimization of global, regional and meso-scale NWP systems | B4 | Y | ILIA + ?? |
| | C2 | ATOVS remapping within OPS | A3 | Y | BRH +OEB |
| | C3 | Scientists gain familiarity with system (ACCESS v0.1) | A4, B4 | Y | ito + All sci |

(*) Half of PXS and RSS

| H1/2007 | | Task | Dep | Doc | Staff |
|---------|----|--|------------|-----|--|
| H1/2007 | | Commence configuration testing(*) | C3 | Y | sci |
| | D1 | Enhancement of BoM observation sets | A3 | Y | TTL |
| | D2 | Test enhanced observation sets: a) hyperspectral soundings b) microwave data c) near surface data | C3, D1, B5 | Y | a) BRH b) CIWT c) TZG + JDK(0.5) |
| | D3 | Develop software for estimation of error covariances | C3 | Y | PXS,SUN JDK(0.5) |
| | D4 | Test alternative error formulations (e.g. NIWA, Met Office) | B4 | Y | PXS |
| | D5 | TC bogus and nudging | C3 | Y | NED + 0.5 ito |

(*) Comparisons between ACCESS v0.1 and current systems should commence as soon as possible to ensure appropriate priorities are given to different developments. The list of assimilation developments is based on known deficiencies as reported by UKMO and NIWA. The nature of the configurations will evolve as enhancements are developed.

Actions for Bureau of Meteorology / ACCESS steering group

1. Procedure for transition to operations to be determined

2. Acquisition of satellite data (AIRS, DMSP, Metop, NPP, ground based GPS, GPS radio occultation, local AMV, etc.) to be arranged for both local and global NWP.
3. Interaction between GFE and ACCESS to be determined.

Activities that will require some level of planning during the next 12 months

- Use of Limb sounding data from polar orbiting satellites
- Use of advanced satellite wind measurements
- Use of GPS occultation data

2. Couple AusCOM with UM (provided by Tony Hirst)

Responsible CSIRO staff:

AusCOM model and OASIS4 transfer and initial testing: D. Bi, new ocean/coupled support scientist requested

Upgrade of coupler in AusCOM: D Bi, new ocean/coupled support scientist requested

Coupling of AusCOM to UM and testing: D Bi, new ocean/coupled support scientist requested

Assessment and further development of ocean and sea ice components: New ocean modeller, new sea ice modeller, ocean/coupled support scientist requested

AusCOM and coupled model evaluation: Additionally 2 FTEs

- Move AusCom (including sea-ice model) to common platform, SX-6; this will require negotiations with TPAC on releasing AusCOM to ACCESS;
- Implement state-of-art OASIS4 coupler on SX-6, gain familiarity, and test coupler using synthetic atmosphere and oceanic data
- Upgrade coupler in AusCOM to OASIS4.
- Conduct multiyear test runs with AusCOM (including upgraded coupler) on common platform;
- Gain familiarity with coupling components of the UM; identify potential pitfalls, particularly with sea-ice; devise strategies for coupling UM with AusCOM (according to UK MetOffice staff, a quick method would be to initially switch off the UM sea-ice component; **(Aim for all above by June 2007)**)
- Replace the ocean component of UM with the most recent version of AusCOM – this will require developing an interface between the UM and AusCOM through the flux coupler to be used in ACCESS (OASIS);
- Prototype physical coupled model (atmosphere/land surface/sea ice/ocean) assembled and ready for testing **(June 2007 - December 2007 depending on level of difficulty experienced during prior steps)**
- Perform short test simulations with the coupled model and determine options for rectification of major deficiencies as necessary. Make decision as to merit of performance of an extended (multi-decadal) simulation to test long term model behaviour **(March 2008)**
- Depending on decision point March 2008, either implement options to rectify major deficiencies and re-test, or perform extended (multi-decadal) simulation and commence evaluation of solution including quality of simulation of interannual variability. **(June 2008)**
- In parallel with above, perform multidecadal length test simulation of AusCOM, assess ocean and sea ice model performance and develop work plan for further upgrade of these components. **(June 2007)**
- First phase of ocean and sea ice upgrade completed and testing performed. Upgrades to be ready for incorporation in full coupled model **(during 2008)**
- Work with UM modellers to separate the sea ice model from HadGAM atmospheric model code and develop capability for modular coupling of sea ice to UM **(complete during 2008)**

3a. Couple CABLE with UM (provided by Yingping Wang)

Task 1. Evaluate the terrestrial biosphere model in HADGEM and develop the optimal strategy to incorporate the existing and future development in CSIRO on land surface modelling into HADGEM

Current plans for ACCESS are to incorporate the CSIRO LSS and carbon cycle to Hadley centre atmospheric model. This requires careful evaluation of the Hadley code provided to us addressing issues such as: what land surface and carbon cycle parameterizations are available and how they would be upgraded or replaced to incorporate the CSIRO schemes. Due to the level of compatibility and modularity of the code coupling is a complex task, but worthy of the investment of time due to the originality and international competitiveness of the existing Australian LSS.

One method of testing land surface/atmosphere coupled model is to compare simulations of atmospheric CO₂ with observations. One element of this is how realistically we transport CO₂ from source/sink regions to atmospheric sampling sites. This can be assessed by participation in TransCom, an international project to compare CO₂ transport simulations. The Hadley Centre global climate models have not been evaluated for CO₂ transport. This will allow us to compare our current CO₂ transport using CCAM with early results from ACCESS. The results will be used to make recommendation about CO₂ transport for ACCESS.

Deliverable 1.1: Acquire the offline version of MOSES and familiarise with MOSES and its implementation in HadGEM (September 2006)

Deliverable 1.2: Visit Hadley Centre, UK to work on taking MOSES out from the implicit atmospheric loop (June 2007)

Deliverable 1.3: Develop CABLE and prepare interface between CABLE and HadGEM (December 2007)

Deliverable 1.4: Evaluate tracer transport in ACCESS using TRANSCOM simulations and make recommendations about CO₂ transport for ACCESS. (June 2007)

Deliverable 1.5: Couple CABLE to HadGEM and complete a preliminary model testing (December 2007).

Total investment:

06-07: 500K per year, AGO funding requested: 250K per year

07-08: 550K per year, AGO funding requested: 275K per year

Task 2: A platform including model-data fusion for offline land-surface model development for ACCESS

This project involves compilation of input and observation datasets, and application of model data fusion methods, for development, calibration, improvement and documentation of the land surface model based on CSIRO Biosphere Model (CABLE) for inclusion in ACCESS. We will compile datasets for input to the land-surface model (e.g. surface meteorological data) and observations for use in model calibration. Packages will be developed for analysis of model output. A model-data fusion system, based on the ensemble Kalman filter, adjoint and neural network techniques, will be implemented for calibration and improvement of the land-surface model. These advanced model-data fusion methods cover different aspects of model

calibration, such as parameter estimation and assessment of systematic biases. All of these components will be incorporated to give a unified modelling platform for efficient offline development and calibration of the land-surface model for ACCESS.

Deliverable 2.1 – Develop the standalone version of CABLE using FORTRAN95 and prepare the documentation. By Sept. 2006

Deliverable 2.2- Compilation of input and observation datasets, output analysis packages for future CABLE development. By Dec 2006

Deliverable 2.3 – Implement the model-data fusion technique for estimating parameters in CABLE. By June 2008

Deliverable 2.4 - Further implementation of model-data fusion methods to assess and remove systematic biases, and to continue model calibration as model complexity increases beyond CABLE. By June 2008

Total investment:

06-07: 400K per year, AGO funding requested: 200K per year

07-08: 500K per year, AGO funding requested: 250K per year

Task 3: Develop a global terrestrial biogeochemical model for studying interactions of climate and biogeochemical cycles for ACCESS

One of major uncertainties in the projection of future climate change is the interaction between climate and carbon cycles. All seven global climate models including the one from UK Hadley Centre (HadGEM) with full carbon cycle predict the positive feedback, or the warmer climate as a result of increasing atmospheric CO₂ concentration will reduce carbon uptake by terrestrial biosphere due to increase in soil respiration. However the predicted strength of the positive feedback significantly varies from model to model because of the large uncertainties in the predicted response of terrestrial carbon uptake to climate, particularly the soil biogeochemical processes including nitrogen and phosphorus cycles. The key to reduce these uncertainties is to include some key processes in ACCESS. One of the important processes that are still missing from the HadGEM is the nitrogen and phosphorus cycling in terrestrial biosphere. The net primary productivity of much of the Australian continent is limited by phosphorus, and therefore including phosphorus is also essential for modelling Australian terrestrial biosphere accurately. Development of a global biogeochemical model for carbon, nitrogen and phosphorus will be one of our major contributions to improve the imported Hadley Centre earth system model for ACCESS.

Deliverable 3.1 Develop the global terrestrial biogeochemical model for carbon, nitrogen and phosphorus including nitrogen fixation and phosphatase production for ACCESS. By June 2007.

Deliverable 3.2 Estimation of model parameters including all pool sizes globally and carry out online simulations using HADGEM. By June 2008

Road-plan and resources requested

| Deliverable | Jun-06 | Sep-06 | Dec-06 | Mar-07 | Jun-07 | Dec-07 | EFT Total |
|-------------|--------|--------|--------|--------|--------|--------|-----------|
| 1.1 | | | | | | | 60 |
| 1.2 | | | | | | | 85 |
| 1.3 | | | | | | | 120 |
| 1.4 | | | | | | | 80 |
| 1.5 | | | | | | | 0 |
| | | | | | | | 0 |
| 2.1 | | | | | | | 85 |
| 2.2 | | | | | | | 180 |
| 2.3 | | | | | | | 205 |
| 2.4 | | | | | | | 0 |
| | | | | | | | 0 |
| 3.1 | | | | | | | 196 |
| 3.2 | | | | | | | 113 |
| SUM | | | | | | | 1124 |
| | | Sep-07 | Dec-07 | Mar-08 | Jun-08 | | |
| 1.1 | | | | | | | 0 |
| 1.2 | | | | | | | 0 |
| 1.3 | | | | | | | 143 |
| 1.4 | | | | | | | 0 |
| 1.5 | | | | | | | 408 |
| | | | | | | | 0 |
| 2.1 | | | | | | | 0 |
| 2.2 | | | | | | | 0 |
| 2.3 | | | | | | | 220 |
| 2.4 | | | | | | | 363 |
| | | | | | | | 0 |
| 3.1 | | | | | | | 0 |
| 3.2 | | | | | | | 243 |
| SUM | | | | | | | 1377 |

Assumptions

- The requested resources and funding are timely met
- HadGEM is running on the CSIRO/BOM supercomputer by April 2005
- Adequate technical assistance is provided by Hadley Centre
- Timely recruitment of new staff members
- The hydrological aspect in CABLE and river routing as implemented in HadGEM will be evaluated by scientists from Bureau of Meteorology
- Other aspects of land surface modelling in CABLE and HadGEM will also be studied if additional resources are available through ACCESS or future collaborations with other Australian institutions, such as isotopes, phenology, dynamic vegetation models and disturbance. The three tasks are the highest priorities for the next two years.

3b. Improving Soil Hydrological Processes for Land-Surface Modelling in ACCESS

Huqiang Zhang, Alan Seed, Yingping Wang

Soil hydrological modelling in the context of ACCESS development

Water is widely recognised as one of the most critical issues we are facing as the consequence of increasing world populations and changes of climate. Furthermore, the water cycle is one of the dominant processes of the Earth's climate system. Therefore, to improve our understanding of the role of water cycle in the weather and climate system and to improve our capability of modelling its potential changes in the future, advancing the parameterization of soil hydrological processes has become an active area of research in NWP and climate system modelling.

Soil hydrological processes have tremendous impacts on surface water and energy partitions. As precipitation is the primary driving force of the land-surface processes, a large number of experiments (e.g. results from PILPS) have showed that without correct modelling of surface runoff partitioning, water and energy fluxes between the land-surface and atmosphere cannot be realistically simulated, no matter how complex the land-surface schemes are. Water cycle and hydrological processes affect weather and climate at a wide range of scales, from NWP, seasonal, climate variability and predictability to climate change studies. In the context of global carbon cycle modelling, soil moisture significantly influences the respiration of soil carbon and other biogeochemical processes. Furthermore, continental river discharge plays an important role in fresh water distribution and in the global oceanic system. In recent years, river flow has also been shown to affect the nitrogen cycle.

Advanced soil hydrological modelling is currently developed for:

- considering soil moisture heterogeneity in global model grids (introducing the concept of fractional saturated area in GCM grid cells);
- considering topographic effects on runoff generation; and
- considering horizontal water movement for river discharge modelling.

Two kinds of hydrological modelling approaches have been widely used for introducing advanced hydrological modelling in land-surface schemes: one is TOPMODEL which directly represents topographic effect on subgrid soil moisture distribution and runoff generation; the other is the Variable Infiltration Capacity (VIC) model which indirectly considers the effects of topography and soil distribution on surface infiltration. Both approaches introduce extra model parameters, either directly derived from topographic data or by calibrating against observations. At the end, river routing is introduced to allow horizontal water movement and simulate river discharges. Besides the importance of river discharge for hydrological applications and water management, river discharge provides significant value for validating land-surface schemes and for improving land-surface models through river discharge assimilation.

Current situation

Hydrological modelling in UKMO HadGAM and CSIRO model:

The current version of CSIRO land-surface scheme CABLE is being considered as the land-surface scheme to be used in ACCESS. It does not explicitly consider soil moisture spatial variation within the model grid and the topographic effect in runoff generation, nor does it have a river routing component. The land-surface model of UKMO HadGAM, which is being considered as the ACCESS atmospheric model, includes a river routing component and uses a statistical approach for representing soil moisture heterogeneity. Detailed information on the hydrological component in MOSES and how it interacts with other components in the model is not available for further comments.

Modelling expertise within BMRC and CMAR for hydrological modelling:

Although there are number of scientists in BMRC and CMAR who have either conducted research related to soil hydrological processes, or interested in conducting some studies on exploring the role of soil hydrological processes in affecting Australian and global climate, none of them has extensive modelling experience on hydrological modelling in global models. Considering the tight timeline for ACCESS development, the joint BMRC-CSIRO ACCESS development should dedicate extra resources to improve soil hydrological modelling for ACCESS in order to achieve a balanced development of land-surface modelling in ACCESS.

Recommendation

An experienced hydrological modeller to be employed specifically for improving water-cycle/hydrological modelling in CABLE as part of the ACCESS land-surface development.

This will complement the tasks planned by CSIRO scientists which are focused on coupling CABLE with UKMO model and improving biogeochemical processes in CABLE for ACCESS. It leads towards a balanced development of CABLE to improve the modelling of energy, water and carbon/nutrient cycles for ACCESS. The highest priority of this person is to implement a world-class hydrology/river routing component in CABLE and perform extensive model validation and calibrations. The expected tasks are:

1. Acquire the offline version of CSIRO CABLE and familiarise with its overall structure, its hydrological component and interfaces with other components in CABLE (~June 2006);
2. Acquire the offline version of MOSES and familiarise with MOSES and its hydrological component, including river routing (~June 2006);
3. Reviewing approaches used in other world-class land-surface models and providing viable options for implementing an advanced hydrology component in CABLE within a reasonable time frame. Possible tasks may include reviewing the advantage/disadvantage of implementing the existing hydrological component in MOSES for CABLE; seeking collaborations for importing a VIC or TOPMODEL-like scheme from overseas; investigating the possibility of using ORCHIDEE hydrology for CABLE (September 2006);
4. Implementing an advanced hydrological modelling component in CABLE for runoff/soil moisture modelling and river routing in ACCESS (~March 2007);

5. Collecting observational datasets and conducting extensive model parameter calibrations for offline experiments and model evaluation (~March 2008);
6. Evaluating the model performance in coupled modelling experiments (timeline with ACCESS IPCC activities).

Relevance to other BMRC projects

- BMRC is currently involved in an eWater CRC project on “Enhanced forecasting of catchment streamflow”. The aims of this project are to develop models that quantify how vegetation dynamics influence stream flow response to climate variability and change, and to develop integrated model-data assimilation schemes for enhanced stream flow forecasting using water balance hydrological models.
- BMRC leads a GEWEX Murray-Darling Basin (MDB) Water Budget Project to monitor and predict key components of the daily water budget across the Basin, to develop real-time products on key components of the water budget for use by water agencies, to observe, understand and model the processes controlling soil moisture in the Basin, and to improve the representation of land surface processes in weather and climate models.
- Land-surface data assimilation has been discussed in ACCESS scientific planning. Land-surface initialisation is also an important issue for NWP and for POAMA development.

Improving hydrological modelling component in ACCESS will add significant values in these activities.

Potential involvement from other scientists

With the recruitment of an experienced modeller to specifically working on water-cycle/hydrological modelling in ACCESS, involvement from other scientists is also necessary to make sure the tasks listed above can be accomplished as planned. It is also important to keep close communications with other activities in ACCESS.

- Huqiang Zhang (30%): involving in developing scientific plans for this project and part of the development activities.
- Yingping Wang (5%): coordinating with other activities in ACCESS land-surface team
- Alan Seed (10%): coordinating with eWater CRC activities
- Postdoc from eWater CRC (50%): participating in hydrology model-data assimilation framework and PhD student working on developing a land surface model-data assimilation scheme.
- Supporting from the ARC Network Earth System Study (Prof. A. Pitman) for establishing collaborations with other institutes for the project activities.

Deliverables

- An advanced soil hydrological modelling component in CABLE for ACCESS

- A balanced development and improvement of CABLE for ACCESS application
- Increased BMRC/CSIRO expertise in water-cycle and hydrological modelling

Assumptions

- Timely recruiting a modeller
- Timely obtaining the offline versions of CABLE and MOSES
- Timely obtaining detailed documents on CABLE and MOSES
- Collaborations with other institutes supported
- Coordinated team efforts in ACCESS land-surface development
- Necessary IT and coding support

ATTACHMENT B

Infrastructure Aspects for ACCESS

Michael Naughton, Asri Sulaiman, Martin Dix, Peter Steinle
Report for 8/3/06 SAG Meeting

We met on 14/2 to discuss Infrastructure needs for ACCESS. Below are dot points on each of the items requested.

Assess and provide recommendations on the computing environments required to run ACCESS for the next two years;

Supercomputing: Running ACCESS systems: BoM-CSIRO will utilise BoM-CSIRO SX-6 facility; facilities for Universities not assessed by this group. ACCESS requirements for 2008-2012 will need to be identified in coming months to flow into planning for 2008 supercomputer upgrade.

Development platform: BoM (BMRC,NMOC) currently use gale (HP) and TX-7s, CSIRO use cherax (SGI) and TX-7s. TX-7s are used for file serving and SX-6 job development only, not for code development and maintenance and diagnostic development work. A common development machine will be needed for cross-organisational ACCESS Teams; facilities for Universities not assessed by this group. BMRC NWP and Climate development and NMOC will still need to have common development server, but this should be expanded to include the rest of the Teams working on ACCESS NWP and Climate. It is recommended that plans allow for a common ACCESS Development Server.

Archiving: BoM uses SAM (HSM) and MARS (DB) and Storagetek silos; CSIRO uses DMF (HSM) and Storagetek. Common archival storage is recommended for ACCESS, which may include use of MARS for climate applications (depending on suitability and resources). Recommend HPCCC be asked to come up with options, possibly within the context of the Data Storage PDP.

Firewall Access Issues: Need to ensure cross-organisational ACCESS teams can have access to facilities inside organisational firewalls.

Assess the software environment, including source code maintenance, locally and at the MetOffice, and provide recommendations for the most appropriate environment to be used for ACCESS;

Source code management: BMRC and CSIRO both use CVS. UKMO have developed FCM based on SVN. UKMO FCM is recommended for ACCESS.

Project documentation: Wiki-based approach is recommended for ACCESS, locally driven, compatible with UKMO Wiki project documentation.

Code standards: UKMO code standards are recommended for ACCESS.

User interfaces and scripts: UKMO systems are controlled by hierarchy of GUI's for each major component/application. GUI's and scripts are managed and maintained in same framework as corresponding applications.

Develop a map of modelling environment for ACCESS, namely individual modules in ACCESS (atmosphere, ocean), couplers and the linkages between the modules;

See figures below.

Archiving standards to be used in ACCESS.

File formats: UKMO uses their own DUMP Format for model files, so we will need to use this also, i.e. for model i-o. Interfaces to and from NETCDF, GRIB exist, and will need to be implemented in ACCESS environment.

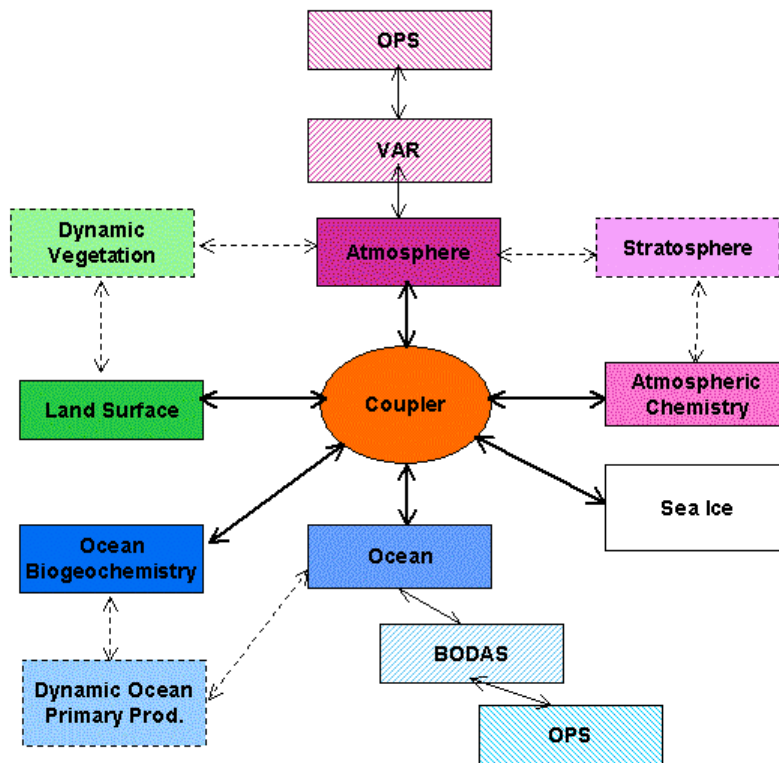
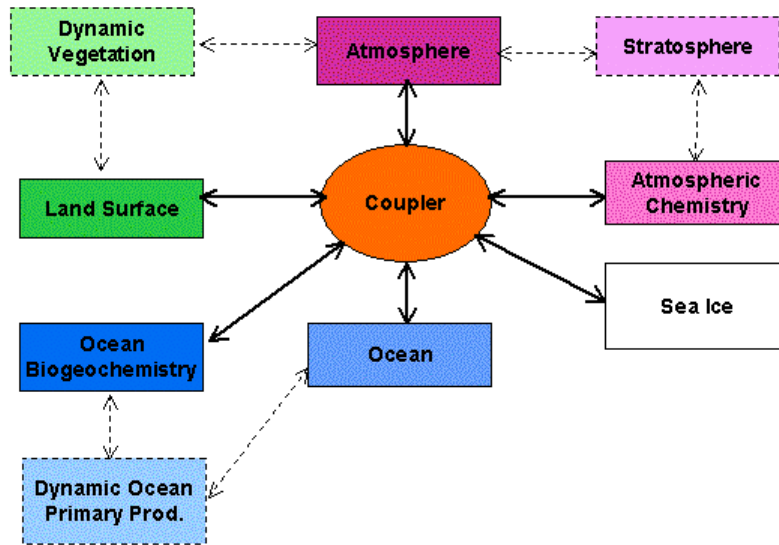
Databases for fields and obs: UKMO make very extensive use of their MetDB, for both observations and fields, which is not being implemented in ACCESS. ODB and MARS will fill the roles of the MetDB for NWP component of ACCESS. Plans will need to be made for ACCESS Climate applications.

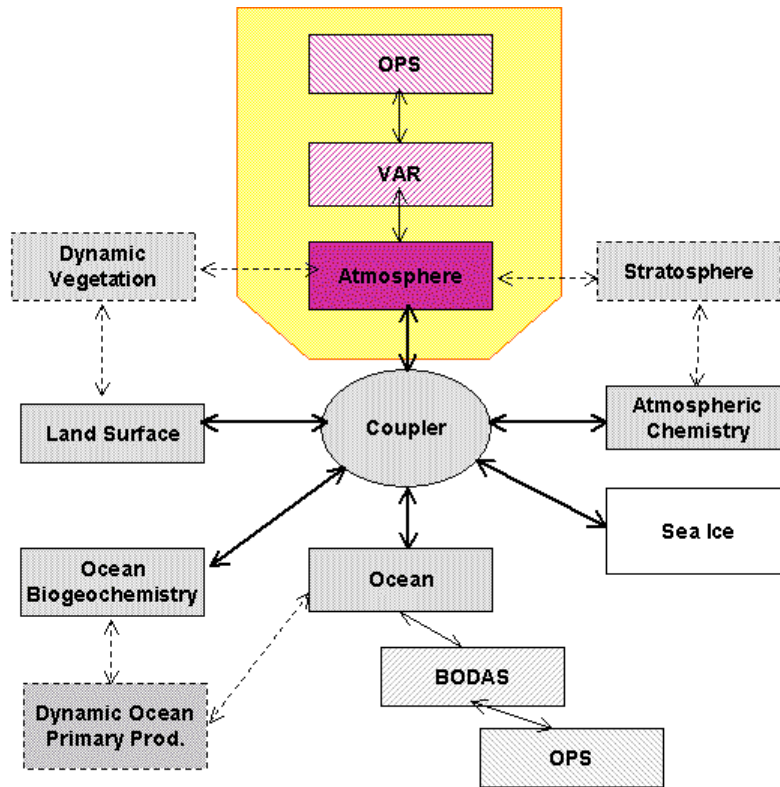
Report on other infrastructure/software issues that the group felt were important
Compatibility with NMOC and inclusion of NMOC operational implementation issues in ACCESS plans is critical for all Bureau ACCESS aspects.

Developing common job-scripting frameworks across the principal ACCESS NWP, Seasonal and Climate applications is also highly important, as otherwise they will be developed differently and incompatibly, leading to complication and inefficiency.

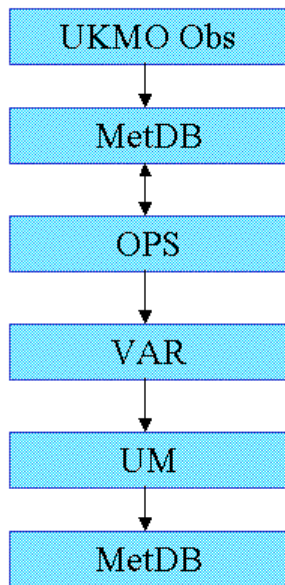
Additionally it would be useful if you could provide a summary of your impressions on the UM and 4DVAR systems, based on the work you have done so far.

Work so far has only been very preliminary. Progress has been slow as there has not been sufficient contact with UKMO staff to enable teething problems to be solved. UKMO documentation is very extensive, but requires someone to guide the way, otherwise it is more overwhelming than useful.

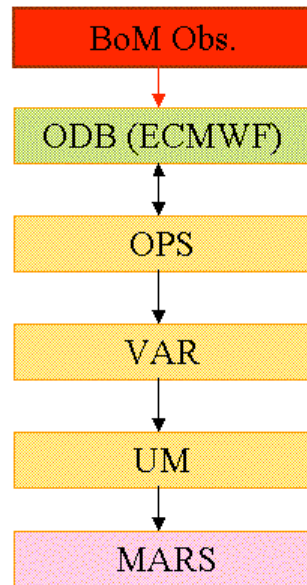




MetOffice



ACCESS



ATTACHMENT C

Chemical Transport Modelling Capability for ACCESS (questions from Peter Hurley)

The following is an initial list of questions for the ACCESS SAG or SC on the initiation of a Chemical Transport Modelling Capability for ACCESS.

Background

The September 2005 Project Plan for ACCESS recommended the following:

Recommendation 1.1.4/1.2.5: *ACCESS should initially import the MOZART Chemistry model in order to gain expertise with running the model in stand-alone mode and to eventually implement simplifications to enable it to run interactively.*

Some information on MOZART is available on the NCAR web pages, including: *MOZART is a comprehensive global chemical transport model of atmospheric composition designed to simulate tropospheric chemical and transport processes. It is driven by standard meteorological fields output from any number of meteorological centers (e.g. the National Centers for Environmental Prediction (NCEP), European Centre for Medium Range Weather Forecasts (ECMWF), or Global Modeling and Assimilation Office (DMAO)) or by fields generated from general circulation models. MOZART was developed at NCAR, the Max-Planck-Institute for Meteorology, and NOAA/GFDL. There are currently 3 versions. MOZART-2 is the tropospheric version that was published in Horowitz et al. [JGR, 2003]. MOZART-3 is an extension of MOZART-2 into the stratosphere and mesosphere (to be released soon). MOZART-4 is an updated version of MOZART-2, including tropospheric aerosols and other improvements. It is currently being evaluated and will be released Jan 2006.*

There is a mailing list for MOZART, as well as email contacts for each version, and it appears that software can be downloaded once User Registration on the UCAR CDP (Community Data Portal) has been completed – it is not yet clear which versions will be available on the CDP. MOZART-3 looks like the only version that currently includes both Tropospheric and Stratospheric Chemistry.

CSIRO has decided to act on the above recommendation by initially allocating 0.5 EFT (Dr Peter Hurley) to begin work on the ACCESS Air Chemistry Capability (from March 2006 onwards).

Initial Questions

The advice of the ACCESS SAG or SC on the following questions would be appreciated:

1. What background work has already been performed on the Air Chemistry Capability for ACCESS, other than that outlined in the September 2005 Project Plan?
2. At what level of the ACCESS organisational structure should NCAR be approached to allow work to begin on the acquisition of the MOZART modelling system via the above contacts and CDP (e.g. Scientist, SAG, ACCESS Leader, Steering Committee, etc)?

3. Which version of MOZART do we require, and what applications are needed for the system in the short-term and for the (potential) HADGEM coupled-version in the longer term?
4. Do we also want to use other 'condensed' (and faster) forms of the MOZART system for the inline version of chemistry in HADGEM (e.g. as seemingly used in some US and European systems), or do we want to develop these as part of ACCESS?
5. What level of developmental control do we want over MOZART, and is this allowable under the Community Modelling System framework that MOZART operates?
6. What are the future plans for MOZART from the NCAR/GFDL/MPI or community perspective, and how do these fit with the ACCESS plans?
7. How does the proposed development of the ACCESS Air Chemistry Capability fit within the Hadley Centre plans (e.g. STOCHEM, UK Chemistry and Aerosols, etc)?
8. What level of support will be provided for the Air Chemistry Component of ACCESS (e.g. organisational structure, funding model, EFT's, number of years, etc)?