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**ARCTIC CLIMATE SYSTEM (ACSYS) STUDY
AND
CLIMATE AND CRYOSPHERE (CliC) PROJECT**

**JOINT REPORT OF THE FIRST SESSION OF THE ACSYS/CliC
NUMERICAL EXPERIMENTATION GROUP
AND
THE ARCTIC REGIONAL CLIMATE MODEL INTERCOMPARISON
PROJECT WORKSHOP
(Fairbanks, Alaska, USA, 11-15 September 2000)**

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ABSTRACT

The first meeting of the ACSYS/CliC Numerical Experimentation Group (NEG) was held in conjunction with the Arctic Regional Climate Model Intercomparison Project (ARC-MIP) Workshop. The meeting was hosted by the International Arctic Research Center (IARC) at the University of Alaska, Fairbanks, USA. The first two days of the meeting were devoted to NEG discussions and scientific presentations. The following three days were devoted to ARC-MIP presentations and discussion. Most of the participants attended the entire 5-day session.

This report summarizes the presentations and group discussions at the meeting. Section A summarizes the NEG-specific portion of the meeting while Section B summarizes the ARC-MIP workshop. The meeting agenda is provided in Annex 1, a list of NEG meeting attendees is provided in Annex 2, and a list of ARC-MIP attendees is given in Annex 3.

Section A: Report of the first session of the
ACSYS/CLiC Numerical Experimentation Group

1. Introduction, Overview and NEG Membership

R. Colony welcomed participants to IARC and provided an outline of its organization and research activities. Of particular interest to the NEG were projects: the Community Arctic Modelling Project (CAMP) which, although still under development, will likely involve model diagnostic studies focused on the Arctic; and the Arctic Climate Impact Assessment (ACIA) which will study the consequences of climate change in the Arctic. G. Flato provided an overview of ACSYS and CliC and described the role and activities of the NEG. The ACSYS/CliC Scientific Steering Group (SSG) had asked that the NEG expand its membership to encompass the following topics:

- ice sheets and glaciers
- snow
- permafrost and frozen ground.

2. Model Intercomparisons and Data Management

D. Lettenmaier summarized progress toward a high-latitude hydrological model intercomparison project which will be done under the auspices of the GEWEX Land Atmosphere System Study (GLASS). The focus will be the Torne River in Sweden and about 30 modelling groups plan to participate. The relevant data sets have been assembled and distributed, and participating groups will conduct model runs and submit output for analysis over the coming year.

A. Lynch outlined the Arctic Regional Climate Model Intercomparison Project (ARC-MIP) and reviewed the results of an initial 'pilot project'. More details can be found on the ARC-MIP web site at: (<http://cires.colorado.edu/lynch/workshop/agenda.html>) and in Section B of this report.

J. Moore (incoming chair of the ACSYS/CliC Data Management and Information Panel (DMIP)) provided an overview of the role of the DMIP. The main activity of this group has been the establishment of the ACSYS Data and Information Service (ADIS), which is an on-line archive of metadata related to ACSYS. More information can be found on the ADIS web site: <http://www.npolar.no/oelke/adis.html>

M. Steele described the Arctic Ocean Model Intercomparison Study (AOMIP) which aims to evaluate Arctic Ocean models by conducting simulations with the same boundary conditions and comparing results to available observations. There are 7 modelling groups participating, and 8 diagnostic sub-projects have been identified. Initial results from some of these were shown. Examples included comparison of horizontal transport, sea-level height, surface salinity, and inferred sound speed along transects.

3. Sea-Ice Modelling

W. Hibler summarized recent work on oriented leads and deformation in sea-ice. Examples of concentrated deformation with a preferred orientation were used to motivate the development of a class of scale-independent, anisotropic rheologies. Results of sample calculations indicated that anisotropic effects could be substantial at small scales, but were less dramatic at the basin scale. It was also noted that basin-scale oriented deformation features could be reproduced by isotropic models at high resolution. The oriented features are largely determined by boundary conditions such as wind forcing and coastal geometry.

C. Bitz provided an overview of the NCAR Community Climate System Model (CCSM) sea-ice component. The latest version employs the 'elastic-viscous-plastic' rheology and a multi-layer/multi-category thermodynamic scheme developed with special attention to water and energy conservation. It was shown that wind forcing from the atmospheric model are still the largest source of error in simulated sea-ice conditions.

M. Steele described sea-ice modelling activities at the University of Washington. These involve development of an 'alternating direction implicit' numerical scheme used to solve the ice momentum equation, and a 'thickness and enthalpy distribution' scheme which involves a 3-layer thermodynamic model and an 'Eulerian' representation of the thickness distribution. Other developments include a global curvilinear grid ice-ocean model and efforts at ice/ocean data assimilation.

W. Maslowski reported on efforts at the Naval Postgraduate School to improve the US Navy's Polar Ice Prediction Scheme (PIPS) – the Navy's operation ice/ocean forecast model. The new version currently uses a 9km resolution grid with improvements to the model's representation of ice dynamics and thermodynamics (very similar to the NCAR CCSM). Further details can be found at: <http://www.oc.nps.navy.mil/~pips3/>

4. Ice-Ocean Modelling

A. Beckmann outlined the Bremerhaven Regional Ice Ocean System (BRIOS) model – a sea-ice/ocean/ice-shelf/atmosphere model. The model is being used to study dense water formation and variability in the Weddell Sea using a grid with resolution ranging from 20 to 100 km. Initial efforts have focused on model validation, comparing model results to available ice and ocean observations. It is found that representing the freshwater input from ice shelf melt is important for getting realistic water mass properties.

P. Heil discussed recent efforts aimed at improving the representation of coupling between ice and upper-ocean motion. The motivation is the observation, from detailed spectral analysis of buoy motion, of significant power at inertial frequencies. By computing the upper-ocean mass transport associated with ice motion, these inertial motions can be simulated. In a basin-scale simulation, this yielded a banded structure in ice concentration due to differential motion and ice-strength coupling.

5. Diagnostic Studies

G. Holloway described a detailed analysis of the heat and freshwater budget components obtained from an Arctic coupled ice-ocean model. The model was first evaluated by comparison with various observations. The advantage of this modelling approach to estimating budget is that the resulting heat and water budgets are mutually consistent.

J. Christensen summarized the results of a regional climate model study in which permafrost extent was estimated from modelled temperature (using a degree-day index). The domain was the Usa river basin in the Ural Mountains. The model produced continuous and sporadic permafrost boundaries in reasonable agreement with observations.

C. Bitz used a dynamic-thermodynamic sea-ice model to assess the Arctic atmospheric circulation produced by several general circulation models (GCMs), using results provided to the Atmospheric Model Intercomparison Project (AMIP). The thickness buildup pattern and ice transport time series provided clear illustrations of the effect of errors in the GCM circulation patterns. There was not clear distinction between high- and low-resolution GCM results.

R. Colony discussed data sets, and initial analysis, for the Barents Sea region. The data include ice edge position from about 1750 onward, and atmospheric and oceanographic data spanning the past 100 years. The data is being made available through the International ACSYS/CliC Project Office.

J. Wang outlined recent analysis of regional variability in sea-ice extent and concentration using a data set (compiled by J. Walsh) spanning most of the 1900s.

6. Sea-Ice Model Intercomparison Project, Phase 2 (SIMIP-2)

G. Flato provided an overview of SIMIP-2 whose goal is to evaluate and improve sea-ice thermodynamic parameterizations for use in climate models. SIMIP-2 is a joint effort of the ACSYS/CLiC NEG and the GEWEX Cloud System Study Working Group on Polar Clouds (Chaired by J. Curry). An initial planning meeting with potential participants was held in Boulder, CO, USA (19 April 2000) and a brief report on this meeting is available on the SIMIP-2 web page at: http://www.cccma.bc.ec.gc.ca/acsys/simip2/plan_mtg.html.

The goal is to force a hierarchy of single-column (one-dimensional) thermodynamic sea-ice models using atmospheric and oceanographic observations made during the SHEBA field experiment, and evaluate the results using corresponding sea-ice observations. Progress so far has included assembly of the data sets into a useable form (largely through the efforts of J. Curry, University of Colorado, and D. Perovich, CRREL). This data will be distributed to participants via the SIMIP-2 web site. G. Flato described the available data sets and discussed results of initial model calculations (done with the assistance of O. Saenko, University of Victoria).

7. NEG Executive Session

The NEG members (G. Flato, A. Beckmann, C. Dick (ex-officio), J. Christensen, W. Maslowski) met the evening of 11 September to discuss the following items:

- expanded membership of the NEG
- the next NEG meeting.

As mentioned above, the ACSYS/CLiC SSG directed the NEG to seek additional members to represent the areas of: permafrost; snow; glaciers/ice sheets. Several suggestions were received from SSG members, from the NEG members, and from participants at the NEG meeting. A short list of potential nominees was assembled to be communicated to Dr. H. Cattle (SSG Chair) for comment.

The format of future NEG meetings was discussed at some length. Given the expanding role of the NEG during the CLiC era, it will not be feasible to adequately cover the full range of numerical modelling topics at each meeting. The consensus therefore was that future meetings should each have a primary scientific theme around which invited speakers and discussion would be organized. Some preliminary suggestions for specific themes were:

- the role of ice sheets in climate interactions and the freshwater cycle
- ice-ocean interactions in the Southern Ocean (Weddell Sea)
- the cryosphere and paleoclimate.

This suggestion will be made to the SSG for comment.

No decision was made on the location of the next meeting pending discussion with the DMIP and OPP Chairs regarding the desirability of holding the next meeting together with one or both of these groups.

Section B: Report of the Arctic Regional Climate Model
Intercomparison Project Workshop

1. Introduction

Recent climate modelling results have highlighted the Arctic as a region of particular importance and vulnerability to global climate change (e.g., IPCC 1990). Despite the climatic significance of the Arctic, many physical processes occurring in this region are still not well understood. Hence, it is not surprising that simulated climates of the Arctic vary widely, depending on the choice of climate model and physical parameterizations. A useful approach for understanding and modelling the arctic climate system is the development and application of regional climate models. The rationale for constructing a high-resolution regional model of the arctic atmosphere is that the treatment of orography and the physical processes are limited in global climate models by both vertical and horizontal model resolution. Further, parameterizations of physical processes specific to the polar region can be tested and implemented in the regional model to assess their interaction with the regional climate system. A regional model of the arctic climate, when driven by analyzed lateral boundary conditions, has the additional advantage of minimizing the impact of model biases or errors from subpolar latitudes. This rationale has convinced several groups in the USA, Canada, Germany, Denmark and Sweden (among others) to construct regional models of the arctic climate, ranging from atmosphere-only models with specified surface conditions to coupled system models including sea ice, ocean and land-surface submodels.

An additional rationale for regional models of the arctic climate system is provided by process experiments such as the Surface Heat Budget of the Arctic Ocean (SHEBA) project (Perovich et al., 1999). SHEBA is an extensive effort to detail the interactive roles played by the atmosphere, clouds, sea ice, and the upper ocean. The centerpiece of the SHEBA project was a one-year deployment of an ice camp that drifted in the Beaufort and Chukchi Seas from October 1997 until October 1998. The surface based observations were supplemented by research aircraft overflights and submarine observations. A goal of SHEBA is to develop improved parameterizations of atmosphere-ice-ocean interactions and to integrate these schemes in fully coupled, global climate models. Regional models, when tested and improved with the SHEBA dataset, can play a crucial role in assessing the processes and parameterizations on a larger scale than could be measured at the ice camp.

A powerful method for improving regional climate simulations is the comparison of simulations produced by different models with each other as well as with available observations. Strengths and weaknesses of model structures, numerics and parameterizations can be assessed side-by-side. The utility of model intercomparisons is greatly enhanced if the models operate under the same external constraints and use a data-rich case study such as SHEBA. An international intercomparison of regional model simulations in the Arctic is being organized under the auspices of the WCRP GEWEX Cloud System Study Working Group on Polar Clouds and the ACSYS/CLIC Numerical Experimentation Group. Representatives of several regional modelling groups attended the workshop at the International Arctic Research Center, Fairbanks, Alaska, USA on 13-15 September 2000. Of the workshop participants, the following groups have agreed to participate. Note that in several cases there is more than one version of the model which will be used:

NARCM	Canada	J.-P. Blanchet, P. Gachon, E. Girard
CRCM	Canada	G. Flato, J. Fyfe
HIRHAM	Germany	K. Dethloff, A. Rinke, J. Christensen
REMO	Germany	D. Jacob, T. Semmler
SWECLIM	Sweden	C. Jones
RAMS	USA	G. Liston
ARCSyM	USA	A. Lynch, J. Curry
MM5	USA	J. Bao, G. Grell, W. Gutowski, O. Persson

In addition to the above models, several participants will use the output of the model experiments to gain insight into the processes involved in other process models, e.g., sea ice (W. Hibler), ocean (W. Maslowski) and cloud (J.-P. Blanchet).

2. Research Questions

Each of the modelling groups will focus on a different aspect of the model intercomparison, but there are some broader questions which can be addressed by this project. The following questions have been identified.

Broad Questions

1. What processes are currently not accounted for (or not well) in Arctic simulations by regional models? What is the appropriate level of complexity of physical process parameterizations?
2. What is the level of uncertainty in current regional climate models of the Arctic, and what does this tell us about the ability of these models to represent natural variability and anthropogenic change? What is the influence of lateral forcing by global climate models in scenarios of future climate?
3. What can we say about the circulation biases experienced in global climate model simulations of the Arctic?

Individual Group Questions

1. What is the effect of horizontal resolution on the simulation of regional climate? How does this affect the important atmosphere-ice-ocean-land feedbacks on regional scales? (*Dethloff/Rinke*)
2. Can we validate boundary layer structure on the meso-gamma scale? Are there significant mesoscale fluxes affecting the GCM scale? How are the turbulent and mesoscale fluxes best represented on the GCM scale? (*Persson*)
3. What is the consequence of neglecting aerosols in Arctic regional climate models? (*Blanchet/Girard*)
4. Can we verify cloud-resolving models? What are the processes involved in scaling this information to mesoscales? (*Blanchet/Girard*)
5. What are the magnitudes of the cloud-radiation feedbacks in the participating models and how do they relate to model formulation and vertical resolution? (*Lynch/Curry*)
6. How accurate do we need to be in the surface radiation budget simulation to get the sea ice growth and melt correct? (*Jones*)
7. How sensitive is simulation of Arctic regional climate to ice motions and how does this feed back on ice motion and concentration? (*Hibler*)
8. How sensitive is simulation of Arctic regional climate to representation of ice concentration and motion? How sensitive is the sea ice to biases in the circulation simulation? (*Flato/Fyfe*)
9. How do open ocean processes influence moisture transport and availability over land areas? (*Liston*)

10. What is the influence of terrestrial spatial heterogeneity, particularly surface pooling of water, on the hydrologic cycle? (*Gutowski*)
11. How do snow distribution and soil moisture influence evaporation and precipitation? (*Jacob/Semmler*)
12. How do models close their terrestrial water budgets? (*Gutowski*)
13. How accurate can we get in simulating the hydrological budget given current data availability? (*Christensen*)

3. Evaluation Data Sets

For evaluation data sets, we focus on the SHEBA year, October 1997-October 1998. The rationale for selecting this period is that high quality surface-based data is available at the SHEBA ice camp in the Beaufort/Chukchi Seas and at the ARM Barrow site, aircraft observations were made during a 4-month period in a region over the Beaufort and Chukchi Seas, and several satellite remote sensing groups are focussing on this period. In addition, extensive data is available from the Mackenzie GEWEX Study (MAGS), a series of large-scale hydrological and related atmospheric and land-atmosphere studies to be conducted within the Mackenzie Basin in Canada. Results from MAGS are intended to provide an improved understanding of cold region, high latitude hydrological and meteorological processes, and the role that they play in the global climate system. Some overlap in time exists between the MAGS field campaign and the SHEBA one. The SHEBA/FIRE Satellite Remote Sensing Working Group has identified the following data sets to be available at the basin scale for the entire SHEBA year:

- AVHRR-derived products (cloud properties, surface and TOA radiative fluxes) will be produced on a 5 km, twice daily scale for the SHEBA year;
- TOVS-derived products (temperature and humidity profiles, cloud properties and possibly surface radiation fluxes) will be produced for 100 km cells;
- The standard SSM/I product from the National Snow and Ice Data Center (NSIDC, Boulder) will also be available for sea ice extent and concentration;
- Sea ice motion products derived from RGPS, AVHRR and SSM/I.

The NASA/NOAA Pathfinder Programme has funded several projects to produce satellite-derived data sets that specifically address the needs of the polar research community. Four of these projects have coordinated their activities to maximize the potential of these data sets by making their combined use as easy as possible. This effort has resulted in common projection and grid systems, standardized variable and file names, tools for cross-referencing and merging, and a lower resolution combined data set that includes the most significant variables from each Polar Pathfinder project. The products are gridded on the Equal-Area Scalable Earth (EASE) grid (Armstrong and Brodzik, 1995) with spatial resolution approximately 100 km. Maslanik et al. (1998, 1999) describe current efforts to use these data to evaluate model output. Schweiger et al. (1999) describe a combination of Polar Pathfinder products and provide links to Polar Pathfinder web sites and additional details summarizing these and other Polar Pathfinder data.

We plan to use all of the data sets listed above that will be available over the western arctic region for the SHEBA year. Errors associated with retrieved parameters in these data sets are being assessed by the SHEBA/FIRE Satellite Remote Sensing Working Group through comparisons with ground-based and aircraft measurements. The rationale for using more than one satellite data set for a given parameter is to assess the impact of errors in a single data set on the conclusions that are drawn from the intercomparison.

4. Domain and Time Periods for Experiment

Due to the extensive data available for model validation and hypothesis testing, the pilot experiment of the ARC-MIP project will be conducted over a time period and domain to coincide with the SHEBA experiment, and will also make use of data available from the FIRE ACE, ARM and MAGS projects.

Period

Models will be initialized in as common a manner as possible on 1 September 1997 (to prevent the requirement for a snow depth and extent initialization product) and continue until 31 September 1998, for a 13 months simulation.

Simulation Domain

The simulation domain will cover the western Arctic, including the SHEBA drift trajectory and the MAGS region, at 50 km resolution. The domain will consist of 70x55 grid points, which has been chosen to allow for the wide boundary forcing zones used by some groups. Individual groups will configure the domain to be as similar as possible to the domain shown in Fig. 1, which is a polar stereographic projection, center and corner latitudes and longitudes as follows:

Point	Latitude	Longitude
Center	72°N	153°W

Vertical resolution and coordinate system will be defined by individual model groups to be appropriate for their model formulation. A survey of those present indicated a range of 19 to 31 vertical levels, with model domain tops between 100 mb and 10 mb, and coordinate systems including sigma and hybrid coordinates.

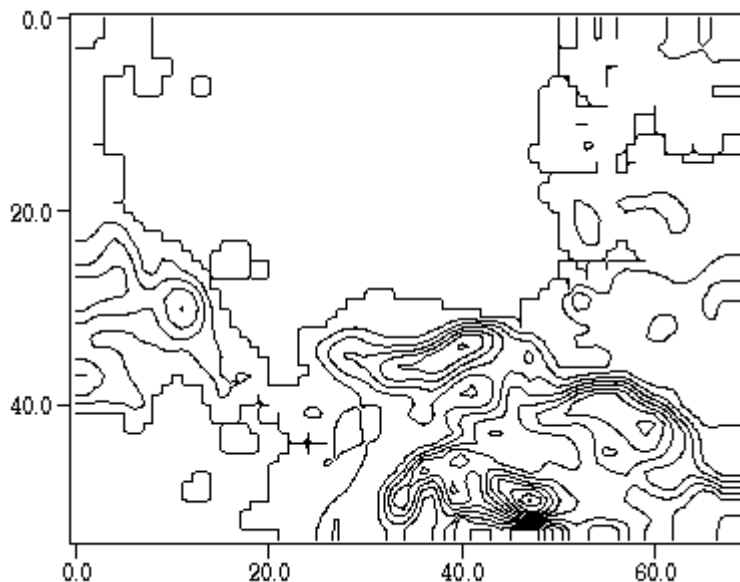


Figure 1. Approximate model domain

Atmospheric Initial And Lateral Boundary Conditions

Atmospheric initial and lateral forcing will be supplied by ECMWF operational analyses and should be updated at 6 hourly intervals. The fields supplied will consist of wind (zonal and meridional components), surface pressure, temperature, humidity and geopotential height.

Surface Conditions

Sea ice will be specified as SSM/I ice concentration and a model-derived ice thickness which is constrained to remain consistent with the SSM/I product. Sea surface temperatures will be derived from the Reynolds data set, although the AVHRR product will also be investigated. These fields will be provided at daily intervals. The land-sea mask and elevation can be derived from the GTOPO30 data set or a data set of the modelers' choosing. Vegetation and soil texture will be chosen by individual modelling groups to be appropriate to their own model. Initial total soil water and soil temperature profiles will be obtained from the ECMWF operational analyses.

Diagnostics

Each model will provide three data sets - a basic model grid description, and two sets of model diagnostics corresponding to two chosen time periods - an annual cycle with a set of monthly average fields, and the FIRE ACE intensive observing period of May 1998 with a larger set of 3 hourly instantaneous fields at times 0, 3, 6, 9, 12, 15, 18 and 21 UTC. Both sets of data will be gridded data set on the models' own grids until funding can be identified to work on moving all model diagnostics to a common grid. The format of the data sets will be netCDF - a postprocessing programme will be supplied to all participants in order to ensure that all model data sets are consistent. For each field listed below, modelers will be required to supply the postprocessing programme with the gridded field, the name of the field, and the units employed (the latter two fields are used as metadata embedded in the file.) Each model should self identify by a four letter acronym to be used as part of the file names as shown below (MMMM = model acronym, mm = month, yyyy = year, dd = day, hh = hour.) This will be defined in the postprocessor so that modelers need only change their model acronym.

Levels for 3D variables: 1000, 975, 950, 925, 900, 875, 850, 800, 700, 600, 500 and 300 mb.

Model grid data set

File naming convention: MMMMgrid.

Fields: latitude, longitude, elevation and land-sea mask (sea may be indicated by an elevation of zero in the elevation data set if desired).

Monthly average data set

File naming convention: MMMM.yyyymm.

Fields:

2D variables: surface pressure, precipitation, surface temperature, latent and sensible heat fluxes, total soil water, 1 m soil temperature, snow cover, 2 m maximum daily temperature, minimum daily temperature, total cloud, downward and upward longwave radiation, downward and upward shortwave radiation, vertically integrated liquid and ice water content.

3D variables: wind (u and v components), temperature, height, specific humidity.

Instantaneous data set

File naming convention: MMMM.199805ddhh.

Fields:

2D variables: surface pressure, precipitation, surface temperature, latent and sensible heat fluxes, total soil water, 1 m soil temperature, snow cover, 2 m maximum daily temperature, minimum daily temperature, total cloud, downward and upward longwave radiation, downward and upward shortwave radiation, vertically integrated liquid and ice water content, cloud base height of lowest cloud layer.

3D variables: wind (u and v components), temperature, height, specific humidity, omega, relative humidity with respect to water and to ice.

5. Data Management

It is recognized that there will be several different data sets produced during ARC-MIP. The initial strategy is to gather the atmospheric initial and lateral forcing and surface conditions data sets at a single location to assure all groups are working from the same initial conditions and to simplify the distribution of data to the groups. Discussions are underway to determine the location of these data at a single university location, an interim data center, or at IARC.

It is also desirable for the diagnostic output from each model, as described above, and the validation data for analyses of this output, be accessible from a single location. This will assure efficient data exchange and permit efficient post processing, statistical analysis, and other intercomparison activities. Common output data format will maximize the consistency and comparability of the model output data. The advantage of using a format like netCDF is that all parameters are explicitly prescribed and the units are known. It would be desirable that model output and validation data be placed on a common grid also. It will be necessary to obtain additional support for a single institution such as IARC or UCAR JOSS, or a university team, to manage the intercomparison data sets and assist with the analysis and assessment of the results. Such a group may also introduce additional science questions and analyses to the intercomparison project.

Annexes

Agenda of the NEG Meeting

Monday, 11 September

1. Introduction, Overview and NEG Membership

- 09:00 Introductory remarks (R. Colony (IARC rep.), G. Flato, A. Lynch)
09:15 Status of ACSYS/CLiC NEG activities and discussion of evolving role and membership as CLiC unfolds (G. Flato)

10:00 Break

2. Model Intercomparisons and Data Management

- 10:30 Overview of ACSYS/GEWEX hydrological model intercomparison studies (D. Lettenmaier)
11:15 Overview of ARC-MIP pilot study (A. Lynch)
11:45 Discussion

12:00 Lunch

14:00 Brief overview of ACSYS data and the DMIP (J. Moore)
14:15 Overview of the Arctic Ocean model intercomparison project (M. Steele)

3. Sea-Ice Models

- 14:45 Anisotropy and leads in sea-ice models (W.D. Hibler III)

15:30 Break

16:00 Development of the NCAR CCSM sea-ice component (C. Bitz)
16:20 Sea-ice model developments at UW/PSC (M. Steele)
16:40 Progress on development of the new PIPS model (W. Maslowski)
17:00 Discussion
17:30 Meeting ends for the day

Tuesday, 12 September

4. Coupled Ice-Ocean Models

- 09:00 Coupled ice-ocean modelling in the Southern Ocean (A. Beckmann)
09:30 Implementation of inertial boundary layer embedding (P. Heil)
09:50 Discussion

10:00 Break

5. Diagnostic studies

- 10:30 Modelling the Arctic freshwater budget (G. Holloway)
10:50 Sea-ice response to wind forcing from AMIP models (C. Bitz)
11:10 100 years of Barents Sea climate data and their analysis (R. Colony)
11:30 Arctic sea-ice oscillation (J. Wang)

12:00 Lunch

6. Sea-Ice Model Intercomparison Project, Phase 2 (SIMIP-2)

14:00 Outline of the SIMIP thermodynamic intercomparison and some initial results (G. Flato)

15:00 Discussion and future plans for SIMIP thermodynamic intercomparison

15:30 Break

16:00 SIMIP thermodynamics discussion/planning cont'd.

18:00 Meeting ends for the day.

Wednesday, 13 September

7. Arctic Regional Climate Model Intercomparison Project (ARC-MIP) Workshop

9:00-9:10 Introduction/Welcome (Amanda Lynch, PI of the ARC-MIP)

9:10-12:20 A.M. Session (Chair: Eric Girard)

9:10-9:40 John Walsh (University of Illinois Urbana-Champaign):
CAMP: the Community Arctic Modelling Project at IARC

9:40-10:20 Klaus Dethloff (Alfred-Wegener Institute for Polar and Marine Research):
A Sensitivity and Intercomparison study of Arctic regional climate simulations.

10:20-11:00 Jean-Pierre Blanchet (University of Quebec at Montreal):
The Northern Aerosol Regional Climate Model (NARCM).

11:00-11:20 Break

11:20-11:40 William Gutowski (Iowa State University):
Project to Intercompare Regional Climate Simulations (PIRCS): Lessons and
Suggestions for ARCMIP.

11:40-12:00 Jens Christensen (Danish Climate Center):
Reducing systematic errors in atmospheric RCMs and GCMs. Is there a simple cure?

12:00-12:20 Colin Jones (Rossby Centre):
Regional climate modelling for northern Europe by SWECLIM.

12:40-14:00 Lunch

P.M. Session: Eric Girard (Chair)

14:00-14:20 Glen Liston (Colorado State University):
Arctic Alaska Climate Simulations using the Regional Atmospheric Modelling System.

14:20-14:40 William Gutowski (Iowa State University):
Regional Climate Simulation for the Pan-Arctic using MM5.

14:40-15:00 Jim Moore (NCAR):
A review of the SHEBA data sets and data archive

15:00-15:20 James Pinto (University of Colorado-Boulder):
Observations during SHEBA/FIRE.ACE Experiments.

15:20-15:40 Break

15:40-16:00 Ola Persson (CIRES/NOAA/ETL): At the ASFG SHEBA Tower.

16:00-17:00 PANEL DISCUSSION (lead by James Pinto).
Panelists: Jim Moore, John Walsh, Klaus Dethloff, Ola Persson
Topics: available data for validation, needs, etc.

Thursday, 14 September

- 9:00-12:20 A.M. Session (Chair: Jean-Pierre Blanchet).
- 9:00-9:20 Amanda Lynch (CIRES/University of Colorado):
Mechanisms in the development and maintenance of sea ice anomalies in the Western Arctic.
- 9:20-9:40 Tido Semmler (Max-Planck-Institut fuer Meteorologie):
Sensitivity experiments with REMO on the influence of the ice edge.
- 9:40-10:00 John Fyfe (CCCMA/MSC):
The preferred structure of variability of the Northern Hemisphere atmospheric circulation.
- 10:00-10:20 Philippe Gachon (Institut Maurice-Lamontagne):
The effects of coupling between the Ocean, sea ice and atmosphere in the Gulf of St. Lawrence on the regional atmospheric circulation, as simulated by the Canadian Regional Climate Model (CRCM).
- 10:20-10:40 Break
- 10:40-11:00 Claude Duguay (Laval University/University of Alaska):
CRYSYS: Variability and Change in the Cryospheric System in Canada.
- 11:00-11:20 Claude Duguay (Laval University/University of Alaska):
The Mackenzie GEWEX Study.
- 11:20-11:40 Rucheng Tian (Memorial University):
Modelling of climate forcing on cold-ocean ecosystems: an application in Conception Bay, Canada.
- 11:40-12:00 Eric Girard (University of Colorado):
The degree of complexity required in microphysics schemes to properly simulate arctic clouds: the SHEBA/FIRE.ACE May case.
- 12:00-12:20 Irene Rubinsten (CRESTECH):
Retrieval of cloud and ocean surface parameters using spaceborne optical and microwave observations.
- 12:00-14:00 Lunch
- 14:00-14:20 Daqing Yang (University of Alaska):
Uncertainties in Estimate of Precipitation Climatology in the High Latitudes.
- 14:20-14:40 Wieslaw Maslowski (Naval Postgraduate School):
The role of sea ice and ocean in Arctic climate change.
- 14:40-17:00 Discussion of experimental design (lead by Amanda Lynch).

Friday, 15 September.

- 9:00-10:20 Plenary session - summary and discussion.

NEG Meeting Attendees

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Klaus Dethloff	Alfred-Wegener Institute for Polar and Marine Research	Germany
Claude Duguay	Laval University	Canada
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John Fyfe	CCCMA, Meteorological Service of Canada	Canada
Philippe Gachon	Institut Maurice-Lamontagne	Canada
Eric Girard	University of Colorado	USA
Georg Grell	NOAA FSL	USA
William Gutowski	Iowa State University	USA
Petra Heil	University of Alaska-Fairbanks	USA
William Hibler	IARC	USA
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