Global Land Atmosphere System Study

GLASS

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A structure to coordinate international land-surface modelling projects.

Evolution towards the second generation of complex land-surface schemes

The end of the 80' saw the implementation of the first complex LSSs in GCMs. Now we are moving towards the second generation of complex LSSs.

The schemes will move from the status of GCM parametrization to that of independent models.

Three workshops have contributed to this evolution :

- IGBP/GEWEX, La Jolla, 1997
- ECMWF/GEWEX, Reading, 1998
- GEWEX/INSU, Gif-sur-Yvette, 1999

The new features of the second generation

The greening of the surface :

≻Introducing the carbon cycle.

≻Dynamical vegetation.

Vertical vs. horizontal complexity :

More emphasis on the horizontal complexity of LSSs :

≻It is needed for surface hydrology.

≻Model evaluation and data assimilation will benefit.

Land/Atmosphere interactions : Our understanding of the sensitivity of the atmosphere to surface processes needs to be improved before new feedbacks are introduced.

integrator of observations : LSSs will be used in assimilation mode to construct global datasets of surface variables.

Achievements in LSS validation

PILPS :

$\succ$ Established the first generation of complex LSSs.

$\succ$ Introduced some basic concepts in the community.

$\succ$ Showed how difficult the coupled problem is.

GSWP :

$\succ$ Raised the question of the meaning of soil moisture at the $1^\circ \times 1^\circ$resolution.

What is needed for the second generation ?

$\succ$ Validate the new processes with off-line point simulations.

$\succ$ Address the sub-grid variability issues.

$\succ$ Study the interaction of LSS with the planetary bounday layer.

$\succ$ Performe coordinated sensitivity experiments with GCMs.

$\succ$ Help modellers participate in inter-comparison projects.

The proposed structure for GLASS

	Point to regional scale	global scale
off-line	**PILPS**	**GSWP**
coupled	**Assimilation Action**	**Coupled Action**

An infrastructure action needs to provide the logistics.

PILPS

Coordination : Ann Henderson-Sellers, Andy Pitman

It is expected that PILPS continues the phase 2 projects. The next in line is PILPS 2e on the Torne River Basin. It will validate cold processes in LSSs.

The following projects could help the second generation schemes :

≻ Use the EuroFlux data for carbon cycle validation.
≻ Valdai mature forest data can be used to explore the snow/vegetation interactions.

GSWP

Coordination : Paul Dirmeyer, Han Dolman

GSWP-2 will use the ISLSCP-II data to performe global off -line simulations over a 10 year period.

⇒ Inter-annual variability of soil moisture.

In the meantime GSWP-1.5 will help prepare phase 2. The following questions will be addressed :

≻ Sensitivity of the LSS to errors in the forcing data.
≻ Which accuracy is needed in the forcing to achieve a given precision in soil moisture ?
≻ With the help of high resolution data improve our understanding of $1^{\circ} \times 1^{\circ}$ soil moisture (Data from the Rhone Basin and CSEs).

The continuation of GSWP will be launched 15 May 2000 at the GEWEX/BAHC soil moisture workshop in Norman.

Assimilation action

Coordination : Hoshin Gupta, Paul Houser, Pedro Viterbo

This group will be launched with an inter-comparison using the ARM/CART data. The scientific questions are :

≻ What are the feedbacks between the PBL and LSSs ?
≻ How does the PBL interact with the surface heterogeneity ?
≻ Is the sensitivity of the LSS different in off-line and PBL-coupled modes ?

With the help of ALMA a common PBL scheme will be made available for these experiments.

The parameter estimation procedure will ensure that the effective parameters are the same in all schemes.

In a second phase data assimilation methods will be tested on this data set.

Coupled action

Coordination : Peter Cox, Randy Koster

Two aspects of land-surface atmosphere interactions are considered to require ***model independent assessments*** :

- Climate sensitivity to anthropogenic forcing
- Climate variability and predictability.

Land-use and climate change experiments are more easily coordinated as the experimental design is simpler.

An AMIP experimental sub-project will be submitted on this topic.

CHEERS
Climate and Hydrological Effect of European Reforestation Scenarios

(Coordinated by Eleanor Blyth, IH)

The FP5 proposal CHEERS will offer a framework for the GLASS coupled action.

Using standard land-use scenarios and SST changes from a transient CO_2increase simulation the following experiments are proposed :

Current vegetation	$1 \times CO_2$
Changed land-cover	$1 \times CO_2$
Current vegetation	$2 \times CO_2$
Changed land-cover	$2 \times CO_2$

The expected results are :

$\succ$ How has past land-use contribute to observed climate change and how will it impact in the future.

$\succ$ Compare land-use effect and CO_2 doubling.

$\succ$ Model sensitivity to land-surface changes.

Coordination and data management will be done by the CHEERS partners but participation will be open.

Advancing Land-surface Modeling and Analysis (ALMA)

Coordination : Taikan Oki, Jan Polcher

The aim is to facilitate the inter-comparison activities within GLASS.

≻ Provide standards for data transfer.
≻ Ensure that data from past experiences remain available.
≻ Distribute software for the modelling and analysis of land-surface processes

Current actions :

- Provide LSS drivers based on the interface defined in PILPS-4c :
  http://www.lmd.jussieu.fr/PILPS4c.html

- PILPS-2e will be the test case for implementing standard data transfer methods.

Implementation

A detailed implementation plan will be available in first quarter 2000.

If this project is approved by the SSG the following steps will be taken :

- A science advisory team will be established. It will include the action leaders and external experts.
- The implementation plan finalized.
- Near term work prioritized.
- A web page and GEWEX-News article will inform the community.
- Ensure links with other GEWEX panels and IGBP/BAHC