GOALS-NEG1 (Numerical Experimentation Group)

Climate Variability and Predictability (CLIVAR) Programme

World Climate Research Programme

Study of Tropical Oceans In Coupled models (STOIC)

An intercomparison of tropical ocean behaviour in coupled ocean-atmosphere models, on seasonal and interannual timescales, focussing on the Atlantic and Indian regions and to investigate the relationship to the Pacific region.

This project is designed to complement the NEG1 ENSIP (ENSO Simulation Intercomparison Project).

Co-ordinator: Michael. Davey (UKMO)

Components:

There are three main components, with differing data requirements. Participants may contribute to any or all of these.

Part A: Equatorial Strip

A1. Equatorial Atlantic and Indian seasonal cycle.

> Diagrams of annual mean and annual cycle (departures from annual mean) SST in the equatorial strip (2N-2S average) of the Atlantic and Indian oceans will be produced. (Similar diagrams for the Pacific form part of ENSIP: cf Mechoso et al, Monthly Weather Review, 1995.). The characteristics of GCM seasonal cycle representations will be examined in comparison with the United Kingdom Met. Office. GISST data set and common areas of systematic error identified.

A2. Interannual variability

> Diagrams of the standard deviation of SST anomalies from the annual cycle (SST') will be produced for the whole equatorial strip in order to examine the ability of CGCMs to reproduce observed magnitudes and locations of interannual variability.

A3. Relation to El Nino

> Diagrams of temporal correlation of SST' with Nino3 SST' (5N-5S, 150W-90W) will be produced for all three tropical oceans. This will provide information about the location and magnitude of ENSO-related variability in the CGCMs, to be compared with observed behaviour in GISST.

> Equatorial strip diagrams of temporal lag correlations of equatorial SST' with Nino3

SST' will be produced for lags of -18 to +18 months, to seek and describe ENSO-related lead/lag relations between the different tropical oceans.

[NB if a model has low/unrepresentative Nino3 SST' variance, other equatorial Pacific regions may need to be selected as reference points for the correlations.]

A4. Non-ENSO variability

The degree and nature of tropical non-ENSO SST' variability will be estimated as follows:

- Nino3 SST' will be used as an ENSO index (or SST' in another Pacific region if necessary, as in A3).
- Patterns of variability associated with the index will be determined (via temporal correlation of SST' and the index), and subtracted from SST' to obtain SST".

(Essentially, information from A2 and A3 is combined to obtain this estimate.)
Diagrams of ENSO versus non-ENSO (SST") variability will be produced.

Part B: Off-equatorial SST extension.

Where SST data is provided for the region 30N-30S, parts A2, A3, and A4 will be extended and longitude-latitude maps of variance and correlations with Nino3 will be produced. In this way, off-equatorial centres of activity can be examined.

Part C: Tropical Atlantic interannual modes and dynamics

An investigation of the relationship between SST', VAT' (VAT = vertically averaged temperature in upper ocean), and zonal and meridional wind stress components (tau') will be made in the tropical Atlantic region.

An EOF analysis of normalised SST', VAT' and tau' data will be used in the region 30N-30S to determine the main patterns of variability in the CGCMs.

Based on the EOF results,

EITHER

- indices of SST' and VAT' variability will be used to construct associated tau' patterns (cf Zebiak J.Clim. 1993) and to investigate equatorial lag correlations

OR

- principal oscillation pattern (POP) analysis will be applied, based on a subset of the EOFs, to look for relationships between SST', VAT' and tau' that may determine the dynamical evolution of major Atlantic interannual patterns in the CGCMs.

The UKMO GISST (Global Ice Sea Surface Temperature) dataset will be used as an observational point of reference.

Summary tables of results for key areas identified in the analysis

For latitude-longitude maps, 2x5 lat-long boxes will be used provide common grids for intercomparison.

Data requirements:

From coupled ocean-atmosphere integrations of about 20 years duration, the following monthly mean values (full values, not anomalies) are requested on a regular grid covering the oceanic regions.

For part A:

SST in the region 5N-5S for all oceans

(Note: Pacific SST, heat content and wind stress for 5N-5S is being requested for the associated ENSIP NEG1 project.)

For part B:

SST in the region 30N-30S for all oceans

For part C:

SST, VAT for upper ocean (down to between 300 and 400m), and zonal and meridional wind stress components, for the Atlantic region 30N-30S (or as much of that region as possible).

Data submission:

The appropriate history files [dimensioned (longitude, latitude, time) for each variable] should be submitted to PCMDI (address below) by **31 December 1996** on 8mm low- or high-density exabyte tape.
PCMDI is making available a software library of data transmission standards to the modelling community. Use of this library to assemble the requested model output prior to submission to PCMDI will facilitate processing, quality control, archiving, and analysis of the data. Submission of data preprocessed with this software is strongly recommended. If preprocessing your output using the software library is not possible, acceptable alternative formats include DRS, net CDF, GRADS (with control file), GRIB/GRADS compatible (with control file), or 32-bit floating point IEEE binary (with Fortran programme to read data).

Please send your data to :

Lawrence Livermore National Laboratory

PCMDI

Attn.: Dr. K. Sperber
P.O.Box 808, L-264
Livermore, CA 94551, USA
Fax. : 1-510-422-7675
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If you need additional information about STOIC, please contact:

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We would appreciate very much if you would inform the International CLIVAR Project Office of your intended participation in the STOIC project.

I wish to participate in the STOIC study: *Yes/No* (delete as appropriate)

I expect to contribute to:

- part A: Yes/No
- part B: Yes/No
- part C: Yes/No

Name:
Address:

Phone :
Fax :
E-mail :

Please return by December 1, 1996 to:
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c/o Max-Planck-Institut fuer Meteorologie
Bundestrasse 55, D-20146 Hamburg, Germany

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