WP 4000 - final report

Objectives:

To develop a database of observed and simulated data on meteorology, hydrology and agriculture for monsoon climates with the aim of improving the collaboration and exchange of results between research institutions in European and extra-European countries, and between scientists with expertise on climatology, hydrology and agricultural resources

Deliverables:

D4001: Web-accessible database, with a public domain component and a protected-access component open to the European and extra-European partners

D4002: Provision of data for selected surface climate variables from (a) global and regional simulations of the present day and 2041-2060 climate, and (b) seasonal prediction ensembles, for use in impact studies

D4003: Caching of relevant observational datasets for impact studies, e.g. records of crop yields, river flows

Summary

Progress with the data archive was hampered by staffing and funding problems at Cineca. Despite these difficulties, D4001 was achieved and the archive was demonstrated at the final PROMISE meeting to a wide variety of researchers from both European and developing countries. D4002 was also substantially achieved, although the archiving of some of the runs was carried out too late for the planned impact studies. D4003 was however not achieved due to the delays in the implementation of the archive architecture. Cineca and ICTP continue to complete the development of the archive after the end of PROMISE and it may, in the future, be extended to include observed as well as modelled data.

CINECA and ICTP

Franco Molteni and Simone Campagna

The PROMISE archive includes observed and simulated datasets on meteorology, hydrology and agriculture, with a specific focus on regions affected by monsoon climates. It has been set up with the aim of improving the collaboration and exchange of results between research institutions in European and extra-European nations (particularly in developing countries), and between scientists with expertise on climatology, hydrology and agricultural resources.

The archive, implemented by the CINECA Inter-University Consortium in Bologna and designed in collaboration with the Department of Meteorology of the University of Reading and the Physics of Weather and Climate Group at the Abdus Salam International Centre for Theoretical Physics in Trieste, has a web-based interface allowing both data retrieval and direct visualization of a subset of the archived fields. In addition, a specific software protocol (DODS) allows users to access remote data over the internet using data analysis and visualisation packages such as Matlab, Ferrat, IDL, and GrADS. Processing of data by DODS-enabled packages is actually performed on the remote data server, with results sent to the "client" in numerical form; therefore users can process a large amount of data without being limited by the memory capacity of their local machines or the speed of their internet connections.

The PROMISE data archive will be maintained (and possibly expanded) in the next years through an agreement between CINECA and the Abdus Salam International Centre for Theoretical Physics.

Short description of currently available datasets

PRISM (Predictability experiments for the Asian summer monsoon)
Simulations using the European Centre for Medium-Range Weather Forecast (ECMWF) GCM were performed to investigate the role of springtime Eurasian snow-cover conditions on the summer Asian monsoon. Mean monthly precipitation and 850 hPa winds for the winters of 1982-1994 are available.

PROVOST (Prediction Of climate Variations On Seasonal to interannual Time-scales)
Seasonal ensemble simulations were performed using the ECMWF GCM for the period 1979 -
1993. Monthly and seasonal means of total precipitation, mean sea level pressure, and maximumtemperature at 2 meters are available for visualization.

Transient climate simulation by CNRM (Centre National de Recherches Meteorologiques)
A climate simulation of 150 years was performed with a coupled ocean/sea-ice/atmosphere model including stratospheric ozone, with a simplified ozone chemistry, in order to simulate the tropospheric warming associated with an increase of the greenhouse effect of carbon dioxide and other trace gases since 1950 and their impact of climate. Monthly and seasonal means of total precipitation, mean sea level

pressure, and maximum temperature at 2 meters from present climate simulations (1966 -1995) and future climate scenario simulations (2010 - 2069) are available.

The GHG (Greenhouse Gas) Experiment by DKRZ (Deutsches Klimarechenzentrum GmbH)

Future climate scenario simulations performed using the CSIRO-Mk2 to investigate the impacts of increases in concentrations of greenhouse gases. The greenhouse gas forcing is increased gradually to represent the observed changes in forcing due to all the greenhouse gases from 1881 - 1990. From 1990 - 2100 increases in concentrations specified by the IPCC'92 scenario IS92a are used.

The GSDIO (sulfate aerosol (direct effect), greenhouse gas, and ozone experiment)
by DKRZ (Deutsches Klimarechenzentrum GmbH)

This experiment GSDIO is the one with the most comprehensive (realistic) forcing scenario. The forcing includes not only the greenhouse gas forcing described with the "greenhouse run" (GHG) but also the direct radiative effect and the indirect cloud effect of historic sulphate aerosol concentrations from 1860 to 1990 and a scenario of sulphate aerosol concentrations from 1990 to 2049. The sulphate aerosol concentrations are calculated in the ECHAM4 model from the sulphur emissions according to the IPCC'92 scenario IS92a. Additionally, the tropospheric ozone has been modified according to IS92a.

The AAXOBA experiment by the U.K. MetOffice

Simulations designed to assess the response to climate change of the Indian monsoon using a regional climate model with boundary conditions provided by a coupled ocean-atmosphere GCM (HadCM2).

Met Office
Richard Betts

Production runs of retrospective seasonal forecasts, performed as part of the DEMETER project have continued with both the Met Office coupled ocean-atmosphere seasonal model (GloSea) and with an uncoupled version of HadAM3 forced with statistical predictions of global SST anomalies. The integrations are made in a 9-member ensemble, to a range of 6 months and from four initial dates each year (the first day of February, May, August and November). Atmospheric initial conditions are taken from analyses generated by the concurrent ERA40 project. Retrospective forecasts for a 42 year period, 1959 to 2001, will be completed by both models before project end (now extended to October 2003). Hindcast production is keeping pace with the progress of ERA40, with 35 of the planned 42 years now complete and available from the ECMWF MARS archive. Verification results calculated over a similar period for GloSea, HadAM3, other participating European models and a seven model multiple-model ensemble may be viewed on the DEMETER website at http://wms.ecmwf.int/research/demeter/index.html . Additional verification of GloSea model performance over selected regions in northern Africa indicates best skill in the outer west Sahel and Guinea coast regions, for which correlations of the 2-month lead ensemble mean predictions of July-August-September rainfall totals with observed totals (over 34 years in the period 1959-2001) are respectively 0.53 and 0.48.

CNRM (MF)
Jean-Francois Royer

In the first year of the project, a climate scenario was performed for the period 1950-2100 with Arpege-Climat version 3 (cycle 22a) coupled the OPA-8.0 version of the ocean general circulation model developed at LODYC, and the sea-ice model GELATO, using greenhouse gas concentration from scenario SRES-B2. The set of requested model output at 24h or 6h frequency was extracted, except for cloudiness for which only the 24-h averaged value is available. The transfer to the Promise database of the requested data from this scenario (SG0) for the two periods 2010-2039 and 2040-2070 was started through the storage systems at ECMWF.

In the second and third year of the project, in complement to the results of the coupled scenario SRES-B2, which were provided for the selected periods 1966-1995, 2010-2039, and 2040-2069, an new simulation forced by the monthly mean observed SSTs over the past 40 years was performed with exactly the same version of the ARPEGE-Climat atmospheric GCM as used in the coupled scenario for purposes of intercomparison and validation. The extraction of the required fields at 24h or 6h time intervals was prepared over the period 1966-1995, and the files were transferred to the PROMISE database.