TerraFLOPS
Service for earth-system-research
Newsletter
Deutsches Klimarechenzentrum
Modelle & Daten
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TerraFLOPS
Service für die Erdsystemforschung

Editorial

Since January of this year when the first edition of **Terra**FLOPS was published the working environment for earth system sciences in Germany has drastically improved. As Wolfgang Sell points out in his article on pages 1 and 2 scientists have busily started using DKRZ's new SX-6 compute-server.

The statistics also reveal that for the first time in many years utilization of available CPU-time at DKRZ is less than 100% (see fig 1). However, the load will increase in the near future as we already received nearly 100 applications for computer time from all over Germany covering a wide variety of research tasks many of which already started. Short descriptions of these projects can be found at

http://www.dkrz.de/science

Scientific results from one already ongoing project are presented on pages 5 and 6. Even with the two coming upgrades scheduled for this August and April 2003 it is important to use the system in a most efficient way. How to make use of the extensive support DKRZ provides to its users in doing so is laid out on page 7.

[Joachim Biercamp]

HLRE - an exceptional tool for Earth System Modeling

After a long and tedious struggle for adequate computing resources in Germany for the Earth System Modelling Community ultimately the HLRE is installed and ready for test and use by the customers of DKRZ. The extensive rebuilding and renovation of the computer rooms and infrastructure required to run a HPC computer complex like the HLRE was finished in time. For the first time since DKRZ started its operations an UPS (uninterruptable power supply) will be part of the infrastructure to help minimizing negative side effects of electric power outages on the computer centre operations. The UPS is complementing the highly redundant layout of the HLRE system, one of the characteristics in contrast to previous systems at DKRZ. Redundancy became inevitable to provide high system availability for such a complex system as the HLRE. Another important aspect of the new system besides its sheer compute power and data storage capacity is the balance between compute- and data-server as well as the network and the possibility to adapt the hardware in future expansion steps to a changing usage profile with respect to the ratio of compute- and data-intensity. Additionally a Global Filesystem (GFS) connected to the Compute- and Data-Server will allow transparent access to the archived data from the Compute-Server and speed up this access significantly.

On February 15th NEC handed the Phase 1 system over to DKRZ for inspection with respect to functionality and performance as guaranteed in the HLRE purchase contract. This first part of the acceptance procedure was finished ultimately on March 12th to be followed by a stability test phase of at least 30 days. Since March 7th the HLRE was already accessible for all DKRZ customers for an initial test phase in a user production environment. ➔

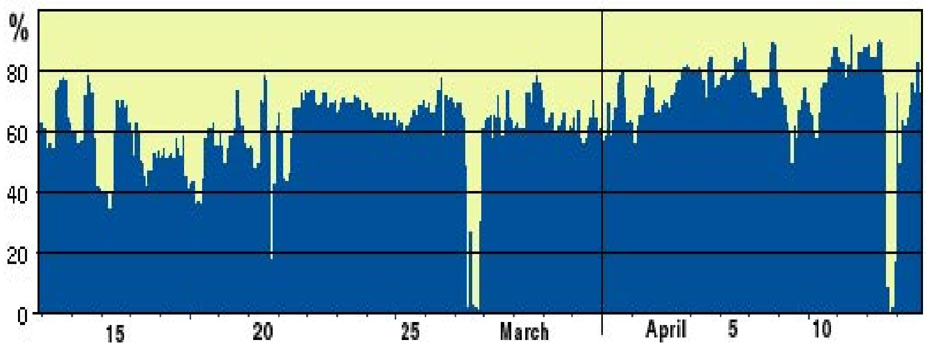


Figure 1: *HLRE-Compute-Server utilization in percentage of total available CPU time from March ,13 until April, 11. The gaps on March, 27 and April, 12 are due to system maintanance.*

Content

HLRE usage during the acceptance phase

The current Compute-Server consisting of 8 nodes NEC SX-6, each node with 8 CPUs and 64 GB of main memory, plus a 9th hot spare node brings DKRZ back into the super computer centre arena. Fig. 2 shows the history of DKRZ's computers and its installed compute power. The current installation with 8 nodes lifts the compute power already above the long term compute power growth line during the period 1985 to 1994 which shows a compute power doubling about every 15 months well in accordance with Moore's Law normally only applicable for RISC based systems. The system expansions scheduled for fall 2002 and spring 2003 will help DKRZ to extend the time into the year 2006 before the installed compute power will fall again under the long term progression line and another upgrade of the system should be provided.

The urgent need for the HLRE installation also becomes evident when looking at the computer time used by DKRZ customers during the first weeks of the stability test phase. Fig. 1 (cover page) shows the total Compute-Server utilization without the hot spare node. The increase in compute power delivered to customers during this period is well above a factor of 10 compared to the average compute power provided to customers in the year 2001. The increase in computing resources used is also reflected by the amount of data transferred into and out of the Data-Server. The observed transfer rates during this initial production phase of the HLRE are about 3 times larger than the average during the second half of 2001, but are still below the expected increase with respect to the installed compute power.

Opportunities and Challenges

The compute power provided by the HLRE supports modelling activities with much higher resolution and complexity as before. Customers of DKRZ qualify again for cooperation with external groups offering DKRZ as a resource for such cooperation. The table on page 8 summarizes for a few disciplines typical for Earth System Modelling the progress that is made in problem size and complexity of models amenable for investigation with the HLRE in comparison to the previous DKRZ compute server.

The numbers given for the different problems and computer systems should provide rough estimates and indicate limitations to be expected for problems which are two small. For problem sizes typical for a T42 resolution the HLRE Phase 1 system is basically the limit for speed up, even for T106 resolution the HLRE Phase 3 system constitutes a limit. Only very large problems like a T213 atmosphere or an eddy resolving ocean are amenable for further improvement on systems larger than the HLRE Phase 3 system. The shadowed entries in the table show on which class of computer system a problem first becomes manageable. The execution times indicated require a parallelization of the model code making full use of the hardware resources provided. Code parallelization thus becomes a challenge to anyone who wants to tackle large problems. Without code parallelization execution times remain in the order given for the CRAY C90 since single CPUs do not become so much faster, the speed up originates mainly from parallel execution. In order to assist customers of DKRZ to become acquainted with writing parallel codes DKRZ will offer tutorials for parallel programming on a regular basis.

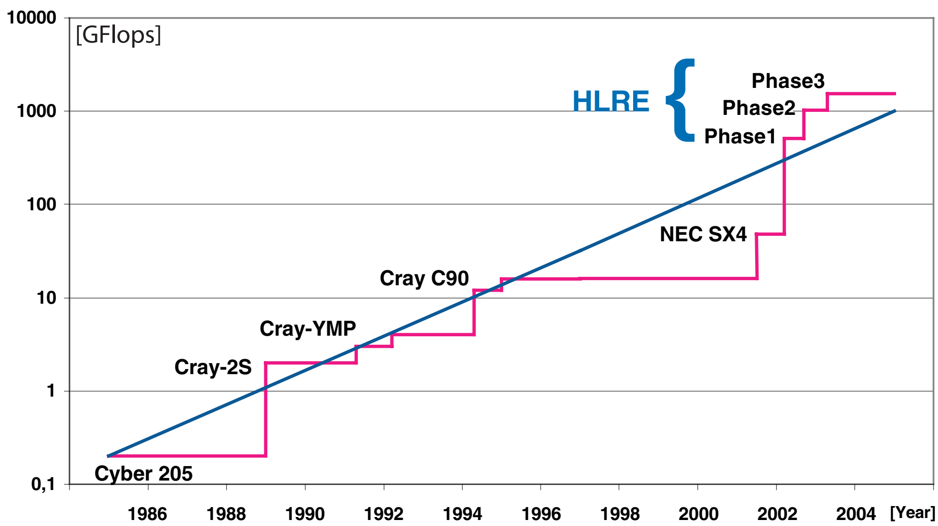


Figure 2: *Peak Performance of Supercomputers at DKRZ [GFlops]. Blue line indicates a doubling of compute power every 15 months (equivalent to "Moore's law")*

Summary

Significant progress has been made since February 2002 with the installation and start of operation of the HLRE. The transition from the old system to the HLRE phase 1 went smoothly without any major disturbance of the computing and data processing activities of the DKRZ customers. The new system is fully accepted by DKRZ customers. For this smooth change and spin up I would like to take this opportunity to thank all staff from DKRZ and NEC involved in the transition for their successful work

[Wolfgang Sell]

The IPCC Data Distribution Centre

In 1996 the IPCC Task Group on Scenarios for Climate Impact Assessment (TGCIA) made a recommendation to install the Data Distribution Centre (DDC) in order to provide data from scenarios of changes in climate and related environmental factors for use in climate impact assessment studies.

In 1997 the DDC has been established. It is run in shared operation between the Climate Research Unit (CRU, United Kingdom) and Modelle und Daten (M&D), using the DKRZ facilities.

Climate modelling centres are invited to provide data from specified model runs that match the criteria defined by the TGCIA.

See: *http://ipcc-ddc.cru.uea.ac.uk/ddc_archive_append.html.*

At this time, data from centres shown in figure 1 are already included or will be included soon.

Shared tasks

CRU hosts the IPCC-DDC home page and the ‚scenario gateway' which includes

- data description
- data visualization
- data download

There, selected pre-processed data are made available such as 30-year average global fields and some visualised information based on the monthly mean data.

Survey of available SRES Scenarion Runs

Center	Acronym	Model	SRES Scenario Runs			
Max Planck Institute für Meteorologie	MPIfM	ECHAM4/OPYC3		A2		B2
Hadley Centre for Climate Prediction and Research	HCCPR	HADCM3		A2		B2
Australia's Commonwealth Scientific and Industrial Research Organisation	CSIRO	CSIRO-Mk2	A1	A2	B1	B2
National Centre for Atmospheric Research	NCAR	NCAR-CSM		A2		
		NCAR-PCM		A2		B2
Geophysical Fluid Dynamics Laboratory	GFDL	R30		A2		B2
Canadian Center for Climate Modelling and Analysis	CCCma	CGCM2		A2		B2
Center for Climate Resrearch Studies (CCSR) National Institute for Environmental Studies (NIES)	CCSR /NIES	CCSR/NIES AGCM + CCSR OGCM	A1	A2	B1	B2

Figure 1: *SRES scenario page*

The M&D-operated part of DDC focusses on the storage and retrieval of the monthly mean values of scenario runs from Atmosphere-Ocean General Circulation Models (AOGCM) associated with IPCC emission scenarios and hence with the IPCC Assessment Reports.

Access

At present, data (monthly means) from IPCC scenarios IS92a as well as SRES emission scenarios can be retrieved from the DDC. The size of the archive amounts to about 13 GByte (April 2002).

The DDC-archive is organised as a part of the CERA database (see also **Terra**FLOPS 1/2002) and thus will make use of a java based graphical user interface to directly access the metadata and transfer the data to the local computer. In future, this interface will provide some basic post processing capabilities like selecting specific regions, quicklook and more.

Presently a HTML based asynchronous data access is in operation. IPCC-DDC data ordered via Web-interface are automatically retrieved from the mass storage archive and are made available in GRIB or ASCII formats on the ftp-server.

Contents

The data sets selected for the DDC archive are chosen with respect to the requirements of impact research. They represent the prediction by the models for the future climate at least until the year 2100. Thus mean quantities of relevant meteorological quantities near the surface as well as a few fields characterising the vertical structure of the atmosphere are set on the list of core and optional parameters (for SRES runs only). Unfortunately these lists (see Fig. 2) are not filled completely with data but most of the core data have been provided from all of the modelling centres.

Monthly mean data for SRES - A2 Scenario

Parameter Description	unit	Variable
core data		
2m mean surface air temperature -> 1.5m	K	temp
2m mean maximum air temperature -> 1.5m	K	tmax
2m mean minimum air temperature -> 1.5m	K	tmin
total precipitation	mm/d	prec
total incident solar radiation	W/m^2	dswf
mean scalar wind speed	m/s	wind
humidity	%	rhum
mean sea level pressure	hPa	mslp
global mean sea level change (thermal expansion)	mm/y	
optional data		
daily mean temperature variance	K	
daily precipitation variance	K	
surface skin temperature / SST	K	
soil moisture (content)	mm	smoi
large scale precipitation (rain/snow)	mm/d	conr/s
convective precipitation (rain/snow)	mm/d	synr/s
snow cover		
snow melt	mm/d	
snow depth (snow amount)	kg/m^2	snat
850 hPa height	gpm	p850
500 hPa height	gpm	p500
200 hPa height	gpm	p200
850 hPa height variance	gpm	
500 hPa height variance	gpm	
200 hPa height variance	gpm	
850 hPa temperature	K	t850
500 hPa temperature	K	t500
200 hPa temperature	K	t200
850 hPa rel. humidity	%	r850
500 hPa rel. humidity	%	r500
200 hPa rel. humidity	%	r200
850 hPa u-wind	m/s	
500 hPa u-wind	m/s	
200 hPa u-wind	m/s	
850 hPa v-wind	m/s	
500 hPa v-wind	m/s	
200 hPa v-wind	m/s	

Figure 2: *IPCC-Data-Distribution Centre. SRES Scenario Data Page: List of variables for the HADCM3 Model*

More information on the IPCC-Data Distribution Centre is available from the WWW at:

http://ipcc-ddc.cru.uea.ac.uk/

or

http://www.dkrz.de/ipcc/ddc/html/dkrzmain.html

[Hans Luthardt]

IPCC: International Panel on Climate Change
http://www.ipcc.ch/

IS92a: IPCC Scenario 1992, projection A
http://ipcc-ddc.cru.uea.ac.uk/cru_data/examine/emissions/is92.html

SRES: IPCC - Special Report on Emmission Scenarios
http://www.grida.no/climate/ipcc/emission/

High resolution climate change signal for regional impact studies

Investigations of the impact of expected climate change signals on the water conditions like water availability and water quality within major river basins in Germany (figure 3) require calculations of very high resolution regional scenarios. These can be done using dynamical downscaling techniques, which allow for changes in the mean climate as well as in the frequency and intensity of extreme weather situations. However, powerful supercomputers like the new SX-6 are the prerequisite for high resolution dynamical downscaling scenarios.

Within the BMBF-funded GLOWA-ELBE (See opposite page) consortium regional scenarios using lateral boundary conditions from a coupled global climate model (ECHAM4/OPYC3 on T42 horizontal resolution) for IPCC Scenario SRES B2 (see page 3) are created at the Max-Planck-Institute for Meteorology using the regional climate model REMO which is supported by M&D and is used by ca. 25 national and international groups. The time slices 1990 to 2000 and 2020 to 2030 are calculated with REMO on 0.5 ° (about 50 km) and 0.16° (about 18 km) horizontal resolution. In addition, within the national project KLIWA several agencies for water management are asking for 0.16° resolution scenarios until 2050.

To address the reliability of climate change studies, it is important to analyse a set of three regional simulations: for today's climate, control and future climate. The validation of the regional simulation for today's climate against observations shows the reliability of model results. As an example the observed and simulated distributions of precipitation intensity in the Rhine drainage basin are shown in figure 1a

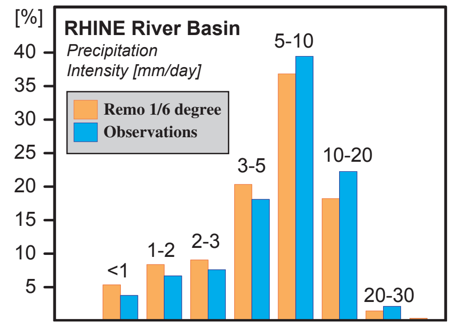
First results from the time slice 2020 to 2030 calculated with REMO on 0.5° resolution for the mean annual cycle of temperature in the Elbe drainage basin (Fig 1b) and as well for precipitation intensity in the Elbe and Rhine bassins (Fig. 2) demonstrate reasonable change, which are possible according to the signal of global change.

Having the SX-6 in place now at DKRZ, simulations of additional 40 years on 0.5° and 60 years on 0.16° horizontal resolution will be performed during the next few months. The data will be distributed within the GLOWA-ELBE and KLIWA communities to about 40 groups for meteorological, hydrological and socio-economic studies. These experiments will be performed using the microtasking (see page 7) version of REMO on one SX-6 node. This will require about 40 days CPU time for the course resolution (7371 grid points on 20 levels, time step 300 s and ca. 500 MByte of memory) and about 6 months for 0.16° horizontal resolution (21901 grid points on 20 level, time step 120 s and 1.5 GB memory).

Having in mind that this is only one realisation of a high resolution regional climate change simulation, which was not possible to do on a smaller computer, much more is needed for ensemble runs. However, ensembles are the only possibility to provide a climate change signal together with uncertainty intervals.

Besides the purely scientific work in such a project it is therefore essential to further investigate performance enhancements of the model and and to increase throughput by making use of several nodes of the SX-6 system in parallel.

[Daniela Jacob]



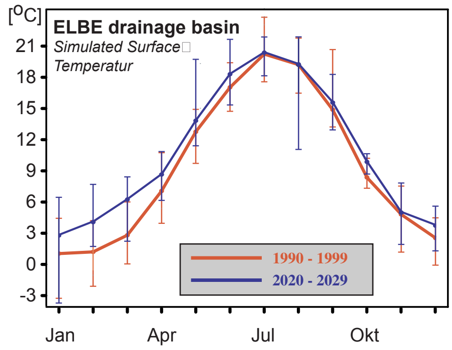


Figure 1a: *observed and simulated distributions of precipitation intensity in the Rhine drainage basin*
Figure 1b: *Simulated mean annual cycle of temperature in the Elbe drainage basin*

Figure 3: *The drainage basins of rivers Ell culations*

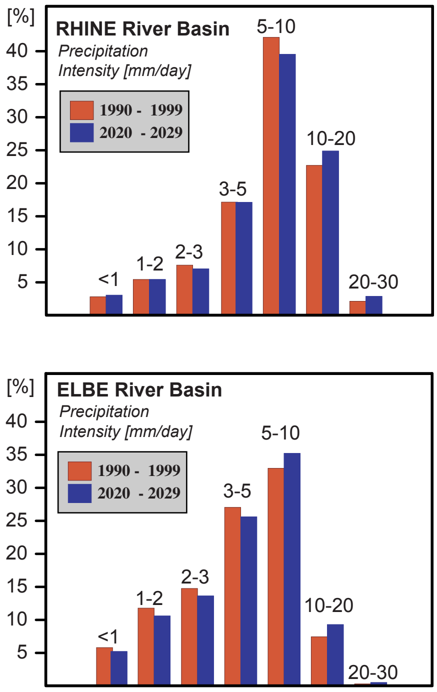


Figure 2: *Simulation precipitation intensity in the Rhine (upper) and Elbe basins (lower)*

be and Rhine as used in the model cal-

GLOWA

The Global Change in the Hydrological cycle (GLOWA) is the first of four programs which make up the BMBF initiative "Research for the Environment".

The aim of GLOWA is to develop integrated strategies for sustainable and far-sighted management of water, lakes and rivers at the regional level, taking account of ecosystem contexts and the socio-economic framework. On the basis of river basins (approx. 100,000 km^2), pilot case studies will be developed to address core issues concerning global change in the hydrological cycle and to develop problem solving strategies.

- Natural variability of precipitation levels and variations caused by human activity and their effect on the hydrological cycle;
- Interactions between the hydrological cycle, the biosphere and land use;
- Water availability and conflicting water uses

Contact GLOWA Program:

Dr. Manfred Gast
GSF - Forschungszentrum für Umwelt und Gesundheit GmbH - Projektträgerschaft Umwelt- und Klimaforschung
E-mail: pt-ukf@ gsf.de

GLOWA-ELBE

Investigation area: Elbe River Basin

The Elbe River Basin (148,268 km^2) covers large parts of two central European countries, namely the Czech Republic and Germany, and different geographical regions from middle mountain ranges in the west and south to large flatlands and lowlands in the central, north and eastern part of the basin. It provides a variety of environmental and socio-economic conditions as well as problems, due especially to the changing political and economic conditions after the German reunification in 1989/1990. A nested approach will be applied, which considers on one hand the whole basin area and on the other hand tributary river basins and subbasins with specific conflicts and problems.

Aims of the project

- to assess and model on the scale of large river basins the complex interdependencies and interactions between the hydrological cycle, climate, land use and society;
- to derive scenarios of change for the 21st century; to develop methods, models and tools for an integrated analysis of the regional impact of changes in climate, economic, political and social conditions with special regard to water availability and quality;
- to derive strategies for sustainable development in river basins by using these models and tools, with special focus on vulnerable subregions and conflict areas.

Research groups from five universities, seven research institutions and two private research companies are co-operating in the project to achieve the project objectives.

Contact GLOWA Elbe:

Dr. Alfred Becker
Potsdam Institut für Klimafolgenforschung
E-mail: becker@pik-potsdam.de

INFORMATION ON GLOWA TAKEN FROM bmb+f BROCHURE "GLOWA"

Workshop on the „Definition of a Community Climate Archive at M&D and DKRZ“

The data workshop which has been organized by M&D at March, 26th and 27th focused on the status and definition of a „Community Climate Data Archive at M&D and DKRZ“. Emphasis was put on German data archives and about 60 participants discussed the strategy during these two days.

The first day was reserved for presentations of existing data archives including their access methods. Meteorology, oceanography, paleoclimate and Earth‘s observation has been covered. Questions like

- Which data are available?
- How can they be accessed?
- Which standard data processing exists?

were discussed during this day. Especially the service which is provided by M&D‘s climate data base system (CERA) and data processing routines (PINGOs) has been presented in detail. The workshop program, abstracts and on-line presentations can be found on M&D‘s website under the topics „News“ and „Conferences and Workshops“.

The second day was reserved for the discussion of the progress strategy and the definition of realization steps. Two working groups which addressed the topics of the community climate data archive and the related secondary data processing were established. Working group mission was to clarify the status, to identify gaps and to agree on a strategy to proceed.

Climate research with respect to data is characterized by time series, means, variances and extremes. The interdisciplinary approach in research requires the combination of different data sources and types. Presently data archives exist for individual disciplines. These archives are operated independently with only little transmissibility. A common online access (portal) to the climate data archives is missing. With respect to interdisciplinary data access it is necessary that all data in the community climate data archive contain context information (meta data) and quality control information. The access is required as climate information requests in space and time: Please give me all information for a certain region and a certain fraction of time. Emphasis had been given on a more easier access to meteorological station data.

The community climate data archive has been defined as a geographically distributed archive. Contributing institutes should have the scientific expertise for their types of data and should guarantee the longterm archiving and access. The data access should follow the ICSU rules for World Data Centres. Serveral institutes made the commitment to participate in the community climate data archive:

DFD (Deutsches Fernerkundungsdatenzentrum): satellite data products and trace gas concentrations

DLR (Deutsches Zentrum für Luft- und Raumfahrt): climate model data

DOD (Deutsches Ozeanographisches Datenzentrum): data from the Global Ocean Observing System and additional sea surface temperatures

DWD (Deutscher Wetterdienst, Offenbach und Hamburg): meteorological station data from KLIS and maritim observations

GFZ (GeoForschungsZentrum Potsdam): atmospheric vertical profiles

MARUM/AWI (Zentrum für Marine Umweltwissenschaften / Alfred-Wegener-Institut für Polar- und Meeresforschung): data from the PANGAEA database system namely paleoclimate information

M&D: climate model data and related observations from the CERA database system

Universität zu Köln: meteorological analysis data from the ECMWF

The group agreed on the following development steps: A central web page will be established which contains the participating institutes, characterizes the available data and names the responsible person. This is planned until June 2002 and will be performed by M&D

Next step is the realization of online access to hopefully all participating archives. In cooperation with PIK, DWD and M&D the opening of the station data mirror at PIK is planned in order to develop an easier access to the DWD archive.

The third step will be the development of unified, online access to the database federation of those archives which participate in the community climate data archive. For this activity a working group is planned which will be coordinated by AWI and M&D

The topic of the second working group was the data processing which has been separated into primary and secondary data processing. The primary data processing focuses on the application oriented data preparation, the secondary data processing evaluates the data in order to answer scientific questions. Emphasis was on the secondary processing which should be able to use data from the community climate data archive. Requirements are to read and write self-descriptive formats namely GRIB and NetCDF and additionally write IEEE and ASCII. None of the available standard routines (GRIB Modules and PINGOs) are able to easily integrate NetCDF. Therefore, the group‘s recommendation is to use the existing experience for the evaluation of a new, more flexible architecture. A clearly defined interface is required which separates the header treatment and primary data processing. These interface definitions will be available as open source in order to allow more groups to integrate processing routines. This new generation of processing routines should be portable to many platforms and should be available as stand-alone package.

M&D and MPIM in co-operation with PIK and the PRISM-project will design the architecture, integrate basic routines and disseminate and maintain the package. It is agreed that more specialized data processing has to be contributed by other groups. In order to maintain current operations it is necessary to connect NetCDF with the existing processing. Conversion from NetCDF into GRIB and vice versa is planned for the interim phase.

[Michael Lautenschlager]

Getting Started on SX-6

A super computer like DKRZ's NEC SX-6 "hurrikan" is a powerful but very expensive working tool. It is therefore very important to use such a tool in an efficient way. The vast majority of models in use today has a potential to be considerably improved regarding both performance measured in operations per second and the total "wall clock time" needed for a simulation run. When designing experiments for the HLRE it is therefore important to be aware of the general architecture of the system:

COMPUTE HARDWARE

Vectorization: The heart of the NEC SX-6 is a powerful vector CPU. It is therefore important to make use of data parallelism and to structure the program in way that allows the compiler to vectorize large portions of the program. (switched on with compiler option *-vopt*). In most cases designing a program for vector CPUs does not harm the performance on scalar systems. An important indication for the performance of a program is the GFlops ratio of the program. This number is printed out at the end of the execution of a FORTRAN program if the environment variable **F_PROGINF** has been set to "DETAIL" On the SX-6 vector processor with its 8 GFlops peak performance one should expect this value to be well **above 2000 MFlops** for well designed models.

Parallelization: general remarks: Whereas vectorization improves the performance of a program by minimizing the total CPU time parallelization decreases the time to solution by doing work in parallel. However parallelization always generates some overhead so the total CPU time will increase. A programmer should therefore very carefully investigate the F_PROGINF information in order to find out the optimal degree of parallelization for his task.

Shared Memory Parallelization: Eight vector CPUs with a shared memory of 64 GBytes make up one "SX-6 node". Within such a node programs can make use of up to eight CPUs in parallel by using the NEC proprietary **autotasking** or **microtasking** features or by parallelising the program in a portable way using the **openMP** library.

Message Passing Parallelization: The HLRE is made up of a cluster of several SX-6 nodes (currently 8, later up to 24). Programs can use several of these nodes in parallel by using the Message Passing Interface library (**MPI**).

Hybrid Parallelization: In many applications it is useful to use shared memory parallelization inside one node and message passing between nodes

QUEUEING SYSTEM

Jobs on hurrikan are submitted via NQS using the qsub command. As a rule it is not necessary to specify a queue but only resources. However, there are some exceptions, for example multi node jobs. For more information on job classes please refer to the HLRE web page. It is important to know that all jobs are submitted from a central interactive node called "cs1". However, jobs are automatically distributed between all nodes. To see all your jobs on all nodes please use the command qstatm .

I/O (FILE SYSTEMS)

Since hurrikan is a cluster of basically independent compute nodes its file system layout is rather complicated. The file systems called /mf and /pf exist only once but are accessible from any node. A programmer always must have in mind that I/O to a file system which is not local to the host where its programm is running is much slower than I/O to a local file system. In many cases this effect can more then double the turn around time of a job. DKRZ therefore provides local file systems on all hosts which may be accessed via the generic path **$TMPDIR**. However, files written to $TMPDIR are no longer accessible after the job finished execution. Within your jobscript you should therfore always copy (**using UNIX command cp !!**) the input data to $TMPDIR before starting the simulation run and later cp generated data from $TMPDIR to /mf or into the archive.

DIRECT PORTING SUPPORT

Jointly with NEC DKRZ offers direct support and consultancy in porting and tuning programs for our machine. Please do not hesitate contact the DKRZ user consultants if you are having problems in running your program on the HLRE or if you are seeing bad performance (see "vectorization" above). In the near future when the system will be getting crowded we will even monitor the performance of jobs and may well reduce the priority of users who do not make use of the DKRZ tuning support.

USER TRAINING :

On April 3./4. these and other items where subject of a user training held in Hamburg. The slides used during these sessions can be found at the HLRE web site. The training will be repeated in Hamburg at the end of this year. For the first week of June we are also planning two more condensed courses in **Jena** (local contact ***mkastow@bgc-jena.mpg.de***) and in **Potsdam** (contact ***boehm@pik-potsdam.de***)

INFO

For more information please refer to the HLRE web site:
http://www.dkrz.de/HLRE => Dokumentation

[Joachim Biercamp]

DKRZ User Group

On Feb. 26th all users of DKRZ were invited to a general user assembly. The directors of DKRZ invited the attendees to form a user group and a user committee. As a first step an ad-hoc group was formed from volunteers in the audience each representing one user institution. The group will meet for a kick off meeting on May 13 in Hamburg. If you want to contact the group, for example if you feel that your institution is not properly represented in the group please mail to

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News from WLA

The 4th WLA meeting was held on January 11th at the Institut for Meteorology and Climatology of the University of Hannover. A new member, Prof. Claus Böning , University of Kiel, was appointed as succesor of Prof. Peter Lemke. The minutes of the meeting can be found at

http://www.mpimet.mpg.de/Depts/
=> Aktuelles

The next meeting is planned to take place in Potsdam on June, 27.

Modeltype and -characteristics	Main Memory	Execution time on respective system			
		1 GF, e.g. CRAY C90	HLRE Phase 1	HLRE Phase 3	Earth Simulator
Global Atmosphere, T42L39, 100a	0,2 GB	3.000 h	150 h	150 h	150 h
Global Atmosphere, T213L69, 100a	0,7 GB	127.000 h (14.5 a)	4.200 h (0.5 a)	2.100 h (3 mon.)	700 h (1 mon.)
Global Atmospheric Chemistry, T42L39, 50 spec., 10a	0,8 GB	2.000 h	100 h	100 h	100 h
Global Atmospheric Chemistry, T106L50, 100 spec., 10a	20 GB	31.000 h (3,5 a)	1.000 h (1.5 mon.)	700 h (1 mon.)	350 h
Global Ocean, T84L20, 100 a	0,5 GB	700 h (1 mon.)	30 h	24 h	24 h
Global Ocean, T672L50, 10 a	64 GB	61.000 h (7 a)	2.000 h (3 mon.)	1.000 h (1.5 mon.)	250 h

Problem size and complexity of models amenable for investigation with the HLRE in comparison to the previous DKRZ compute server and to the Japanese Earth System Simulator. The shadowed entries in the table show on which class of computer system a problem first becomes manageable. For further information please refer to the article of W. Sell on pages 1 and 2.