

Reporting year: 2006

Project title: Numerical experiments with a high-resolution ocean model

Computer Project Account: spdeombg

Principal Investigator: Jin-Song von Storch

Affiliation: Max-Planck Institut fuer Meteorologie

Start date of the project: 1. January 2006

Expected end date: 2007

Computer resources 2006:

allocated: 433 000 HPCF
used: 150 HPCF

Summary of project objectives:

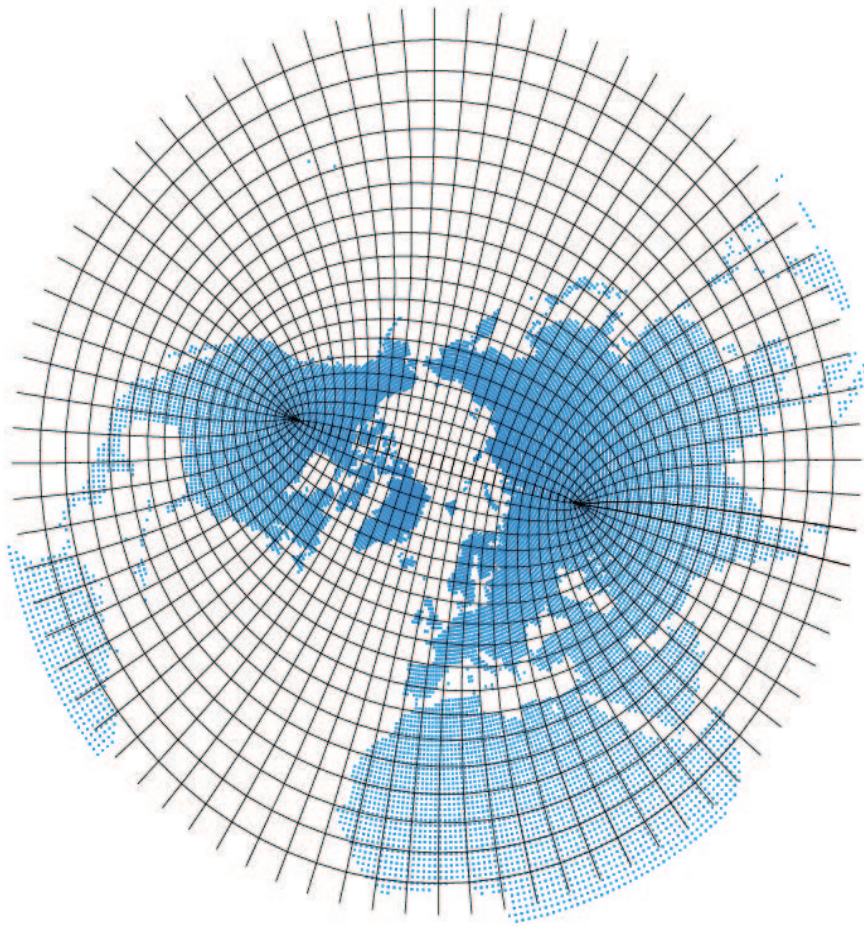
The first step of the work proposed is the development of the high-resolution version of the MPI-OM ocean model. The IPCC runs performed with the MPI-OM at different resolutions (i.e. with MPI-OM/GR3 and MPI-OM/GR15) show different changes in the meridional overturning circulation in warmer climates. The result suggests that the response of the meridional circulation might depend on the resolution of the ocean model. To study this dependence, high-resolution versions of the MPI-OM model will be developed.

Summary of problems encountered

The standard MPI-OM model has an Arakawa C-grid and uses a bipolar orthogonal spherical coordinate system. If the poles are not antipodes (i.e. not diametrically opposed), which is the case when placing the poles over land, orthogonal meridians and parallels are constructed according to the choice of zonal and meridional resolution. The resulting curvilinear grid has much higher resolution near the poles than further away from the poles. Such a grid is useful for regional studies, but does not suit global high-resolution modeling.

Summary of results of the current year

To solve the grid problem, a new grid is developed. It is a lattice from families of confocal ellipses and hyperbolae. The grid uses two foci lying on either side of the N Pole. It is orthogonal everywhere. The grid cells have essentially the same size. An example of the grid is included. A 4^o-version of the model has



been successfully run on the NEC machine in Hamburg. A 0.4° -version is ready for further tests.

Parallel to the grid development, the new version of the coupled ECHAM5/MPI-OM with the standard ocean grid have been implemented on the IBM machine. Further tests to achieve optimal performance are underway.