



OASIS: A code coupler for climate modelling

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Coupling numerical codes is a central issue in the climate research community and in other research fields such as electromagnetism and computational fluid dynamics (CFD). As the climate modelling community is progressively targeting higher resolution climate simulations run on massively parallel platforms with coupling exchanges involving a higher number of (possibly 3D) coupling fields at a higher coupling frequency, a new fully parallel coupler OASIS4 has been developed within the EU FP5 PRISM project and is now supported and developed further within the PRISM Support Initiative.

OASIS4 is a software allowing synchronized exchanges of coupling information between numerical codes representing different components of the climate system. The concepts of parallelism and efficiency drove OASIS4 developments, at the same time keeping in its design the concepts of portability and flexibility that made the success of OASIS3. During the run, OASIS4 Driver extracts the configuration information defined by the user in XML files and organizes the process management of the coupled simulation. OASIS4 Transformer performs, in a fully parallel mode, the interpolation of the coupling fields. OASIS4 supports 3D and 2D coupling fields. To interact with the rest of the coupled model, the component models have to include specific calls to the OASIS4 PRISM System Model Interface Library (OASIS4 PSMILe), which, at runtime performs fully parallel the MPI-based exchanges of coupling data including automatic repartitioning, either directly or via additional Transformer processes, and file I/O using the GFDL mpp_io library. The OASIS4 PSMILe Application Programming Interface (API) was kept as close as possible to OASIS3 PSMILe API. This should ensure a smooth and progressive transition between OASIS3 and OASIS4 use in the climate modelling community.

OASIS4 portability and scalability have been demonstrated with different "toy" mod-

els run on the following platforms: AMD Athlon 2800 Cluster, AMD Opteron 848 Cluster, Intel Pentium 4 Workstation Cluster, Intel Xenon Cluster with SCI Interconnect, NEC SX6, SGI O3000/2000 server with MIPS 4 processors and IRIX64, SGI IA64 Linux server Altix 3000 and IBM/AIX 5.2 p690.

Currently, the community of OASIS4 users is restricted to the GEMS community (3D coupling between atmosphere and atmospheric chemistry models), to SMHI (regional coupling), and to IFM-GEOMAR (use of OASIS4 with pseudo models to interpolate high resolution data onto high resolution model grids). After the current testing period, OASIS4 will be released to a larger community.