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OASIS4: a code coupler for the climate modelling CICLE project

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Coupling numerical codes is a central issue in the climate research community. OASIS4, a new fully parallel coupler for Earth System models, is being supported and developed within the PRISM Support Initiative (http://prism.enes.org) and will be used in the climate modelling project CICLE (http://dods.ipsl.jussieu.fr/omamce/CICLE/).

OASIS4 is a software allowing synchronized exchanges of coupling information between numerical codes representing different components of the climate system. The concepts of portability, flexibility, parallelism and efficiency drove OASIS4 developments. 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 Transformer performs, in a fully parallel mode, the interpolation of the coupling data. OASIS4 supports 3D and 2D coupling fields.

OASIS4 is currently used in few climate applications such as in the FP6 European GEMS project for 3D coupling between atmosphere and atmospheric chemistry models, by the UK Met Office for optimised ocean-atmosphere coupling, by SMHI in Sweden for regional ocean-atmosphere coupling, and in the CICLE project.

The CICLE project (Calcul Intensif pour le CLimat et l'Environnement) funded by the French Agence Nationale de la Recherche, aims at developing a new generation of climate coupled models, taking advantage of the current and future high performance computing platforms to realise "frontier" simulations in order to better understand

and predict the Earth climate. In particular, two sophisticated coupled models will be assembled, one at the Institut Pierre Simon Laplace (IPSL) and one at Météo-France. The IPSL model will couple parallel components of ocean dynamics, sea ice, marine biogeochemistry, atmospheric dynamics and chemistry, soil and vegetation component models. The Météo-France will imbed a regional ocean-atmosphere coupled model, based on ALADIN-Climat and OPA9 Mediterranean, into a global ocean-atmosphere model assembling ARPEGE-Climat V4 and OPA9. These coupled models will exploit the fully parallel and optimised structure of the new OASIS4 coupler.