An ocean general circulation model on a quasi-homogeneous non-orthogonal cubic grid

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An ocean general circulation model(OGCM) for high-resolution global simulation is now being developed in Frontier Research Center for Global Change(FRCGC). The traditional longitude-latitude grid, which is commonly used in current OGCMs, is not used by the OGCM. Instead, a cubic grid proposed by Purser and Rancic(1998) is used. This cubic grid is more homogeneous than other cubic grids and thus allows a longer explicit time step. Since the cubic grid is not orthogonal, an OGCM on non-orthogonal curvilinear coordinate has been developed. The OGCM is a primitive-equation, finite-difference, level-coordinate model. The model variables are staggered by using the Arakawa B-grid. Explicit free surface method is used for the barotropic mode solver since this method does not require to solve elliptic equation, which degrades computational performance on parallel computers. The model was evaluated by carrying out 1000 yr integration with about 150 km-resolution. The result was compared with that of longitude-latitude based OGCM with about the same resolution and showed good agreement. Development of eddy-resolving cubic-grid OGCM is now underway. The model have been parallelized and ported to the Earth simulator, a massively parallel supercomputer.