9. Coupler (Scup)

The simple Scup coupler was developed at MRI as a general-purpose coupler for coupling component models for integration into an ESM. Each component model in MRI-ESM1, the atmospheric model, ocean-ice model, aerosol model, and atmospheric chemistry model, uses Scup to exchange data with the other component models. Scup makes it easy to develop an integrated model composed of an arbitrary combination of these component models.

Scup has several excellent features (see Yoshimura and Yukimoto, 2008, for more details).

- High-speed data transfer is possible owing to direct communication between the parallelized component model processes via Scup.
- Different coordinates and grids can be used for each coupled component model, since Scup supports 2-dimensional and 3-dimensional grid transformation with good conservation accuracy.
- Component models to be coupled, variables to be exchanged, and the timing of the data exchange can be flexibly changed by modifying the settings of the configuration file 'Scup Namelist'.
- All Scup subroutines are coded with Fortran95, so the Scup library can be compiled on any platform that has a Fortran95 compiler and an MPI library.

As shown in Fig. 15, distributing the communications reduces the amount of transferred data and leads to high computational efficiency. Using the settings in the Scup Namelist configuration file, the models can be executed in parallel or sequentially (Fig. 16); accordingly, we can distribute the execution of the component models in the most efficient way on the computer being used.

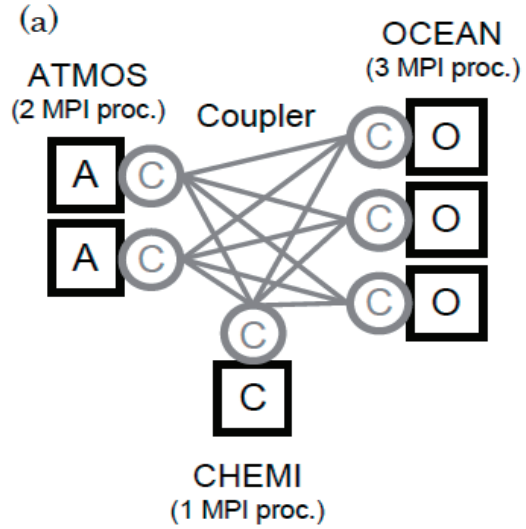

Figure 15 Schematic diagram of communication with Scup among three component models (ATMOS, OCEAN, and CHEMI).

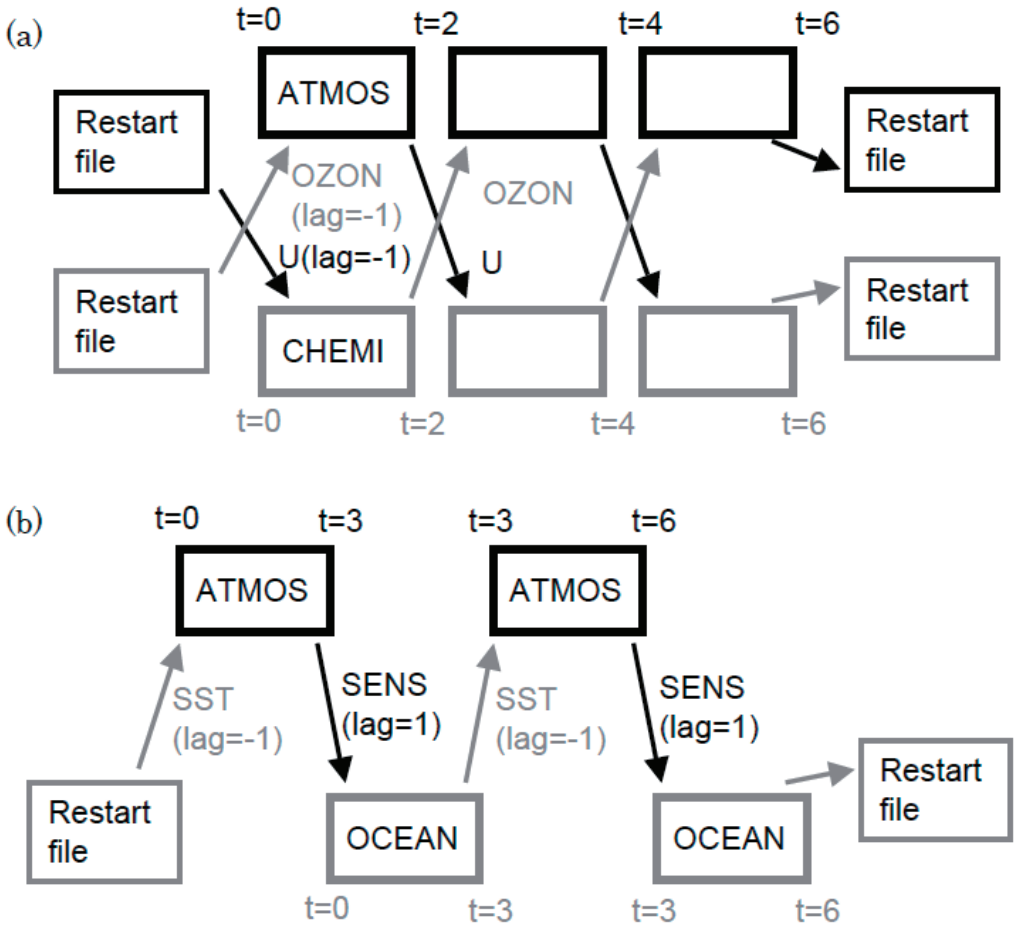

Figure 16 Schematic diagrams for patterns of model coupling. (a) Concurrent coupling, where two component models are executed concurrently. (b) Sequential coupling, where two component models are executed sequentially and alternatively at given time intervals.