A management for enormous data in highly resolved global atmospheric simulation output by AGCM (AFES) on the Earth Simulator

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http://www.es.jamstec.go.jp/

The dream has always been a dream for the people who wants to know physical phenomena by computer simulation to calculate with a numerical model in high-resolution as much as possible. The Earth Simulator (ES), started its operation in March 2002, is one of the computer systems to realize such a dream for an advanced large-scale simulation. A spectral-method atmospheric general circulation model AFES (AGCM For Earth Simulator) developed for highly resolved simulations on the ES has achieved an ultra high resolution simulation of T1279L96 (10.4 km horizontal mesh at the equator and 96 vertical layers). With the resolution of T1279L96, typical mesoscale phenomena such as typhoons, extra-tropical cyclones and baiu front are simulated in the global field. Climate simulation for cumulus parameterization sensibility is available with the T319L24 (41.7 km horizontal mesh at the equator) resolution, which is much higher resolution than major climate AGCM resolution of T42 (314 km horizontal mesh).

A highly resolved numerical simulation has actually come true on the ES, however, the nightmare expected before the simulation has also come true. Ultra high resolution simulation with the AFES produces huge output data after calculation. In fact, the simulation for typhoons of the T1279L96 produces 2.63 GB output file of graphics for one 3-dimansional variable as a snapshot. Total 19 2- or 3-dimensional variables output every 3 or 6 hours produced over 3TB output data for 16 days simulation term. Climate simulation of the T319L24 outputs 34.8 GB output data a year for 23 variables output every 6 hours / 5 days / 1 month. 10-years simulations of the T319L24 for 3 types of cumulus parameterization scheme produce 348 GB output data for each case.

We will introduce how much enormous data has been produced by the AFES in high-resolution of the T1279 and T319 and managed on the ES. The enormous data problem on the ES is a common problem for the people who want to simulate a high-resolution simulation on a huge computer system such as the ES.