R&D field: Earth science

Super-resolution Ocean General Circulation Model (OGCM)

- Program name: COCO
- Developer
  Hiroyasu Hasumi, Associate Prof. of The Univ. of Tokyo
- Abstract
  - ☐ Description of the ocean at super-resolution and precise computation of both the world ocean circulation and local oceanic change.
  - ☐ Online calculation of chemical and biological processes to simulate oceanic biogeochemical cycles and fishery resources.
- Algorithm
  - ☐ Discretization with the finite-difference method.
  - ☐ Transport calculation with the second- and third-order accuracy in time and space, respectively.
  - ☐ Horizontal two-dimensional domain decomposition method.
  - ☐ MPI Parallel computation.
- Current computation size
  - ☐ Lattice points $1280 \times 912 \times 48$ (centennial integration).
  - ☐ Sustained performance 1.4TFLOPS (76 nodes of Earth Simulator).
  - ☐ Memory 10 GB and disk 5 TB.
- Future computation size in 2010
  - ☐ Several times of the current variable numbers (living and chemical species) and 100 times of the current lattice points.
  - ☐ Memory 10 TB and disk 1PB.

Sea level

Sea surface temperature
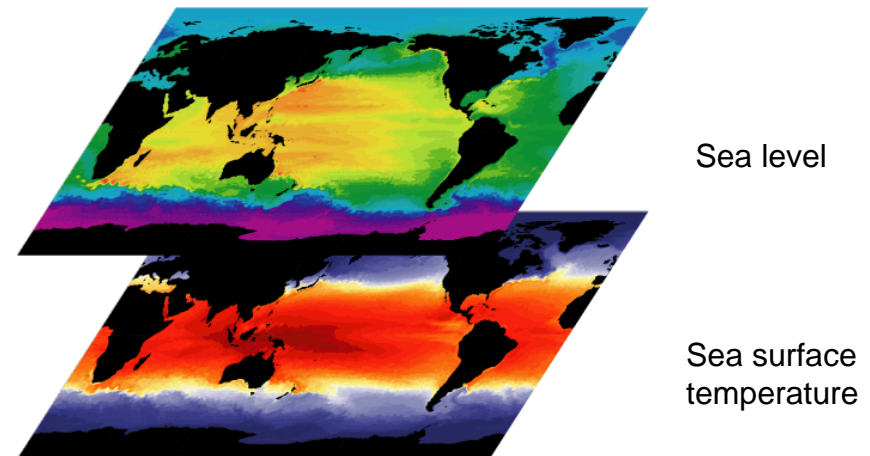
Sea level and sea-surface temperature simulated with the high-resolution ocean general circulation model.

- Expected results
  - ☐ COCO can estimate climatic variation such as global warming accurately by expressing ocean current and its variation.
  - ☐ COCO can also reliably estimate ocean-related influences of climate changes (such as global warming) on human and its society (e.g. high water and change of fishery resources), by combining it with a high-resolution coastal ocean model.
- Reference
  - ☐ http://www.ccsr.u-tokyo.ac.jp/~hasumi/guide/