Earth Simulator

EARTH SIMULATOR

3rd Generation: March 2015 ~ February 2021

3rd Generation Earth Simulator

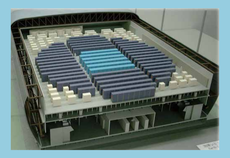
Hardware

Total performance
- Total number of processor nodes: 5,120 nodes
- Total peak performance: 1.31 PFLOPS
- Main memory: 320 TB

Node
- Number of CPU: 1 (4 cores)
- GFLOPS: 256 GFLOPS (64 GFLOPS x 4 cores)
- Memory bandwidth: 256 GB/s
- Memory/node: 64 GB

SX-ACE Node card

Customized LSI:
28nm, 1GHz, 23.05mm x 24.75mm



Earth Simulator (1st Generation)
320 cabinets
Total peak performance 40TFLOPS
(March 2002)

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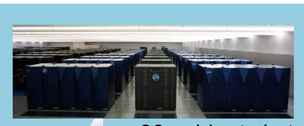
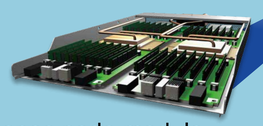
Earth Simulator (3rd Generation)
2.5 cabinets
(March 2015)



80 cabinets in total

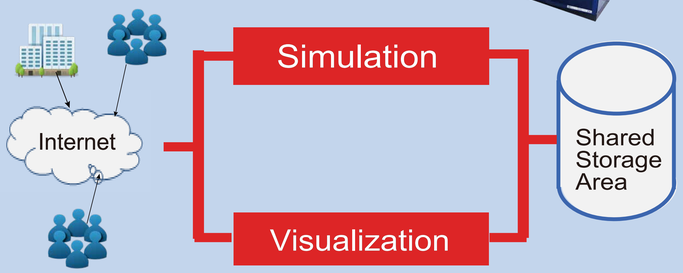
64 nodes/cabinet



High spec node module
(with 2 nodes)

System Outline

Earth Simulator



The total number of projects: 57
The total number of ES users: 714
(As of Oct. 2, 2020)

Shared Visualization Server

In 2002, Earth Simulator (1st Generation) was introduced for a purpose of solving global scale environmental phenomena and predicting future environment, and accurately executing challenging numerical simulation. The computer system made a significant contribution to the development of numerical simulation in the area of earth science and related technical fields.

In March 2015, Earth Simulator was upgraded to new system as the 3rd generation. Total peak performance of the latest system is 32 times higher than the first one, and the system conducts more elaborate calculations and larger scale simulations. Research results have been published for contributing to solve mechanisms of global environmental problems, crustal changes and seismogenic process, and for predicting the damage caused by the tsunami.

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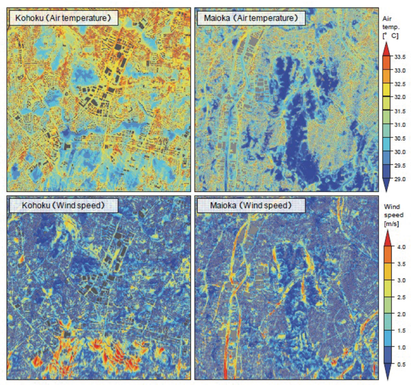
EARTH SIMULATOR

Earth Simulator Resources are allocated for researches at JAMSTEC and domestic researches, such as oceanography and earth science field and related researches.

FY2020 Earth SImulator Resource Allocation

Proposed research project:

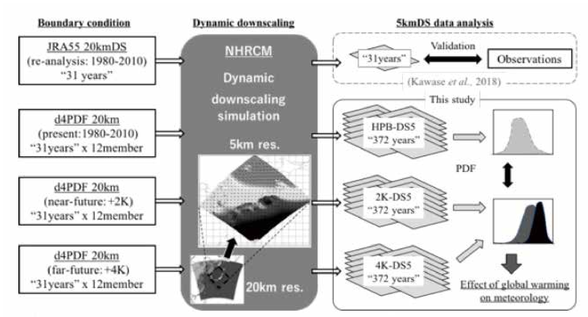
There are the public applications focus of oceanic science, earth science, and related objects for the outside of JAMSTEC.



Horizontal Distribution of temperature and wind speed.

Project Name: Making Urban Environmental Design Guideline for Mitigation of Urban Warming
Project Leader: Takahiro Tanaka (Hiroshima University)

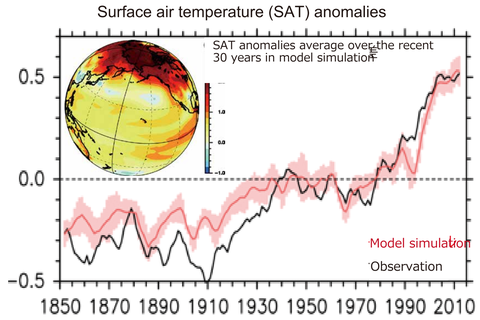
Project Name: Climate Change Projection Using a Regional Climate Model
Project Leader: Takeshi Yamazaki (Tohoku University)



A design of the ensemble warming prediction by the regional climate model

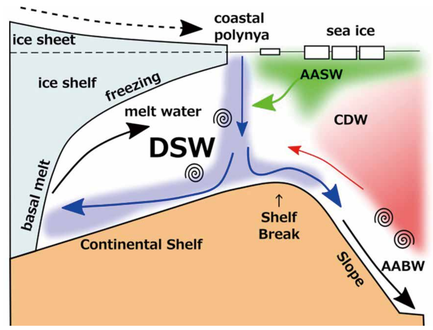
Contract research Project:

The projects using the Earth Simulator focus on research commissioned by public organizations such as the government. (TOUGOU, JST/CREST, KAKENHI, etc.)



CMIP historical simulation using MIROC global climate model

Project Name: Prediction and Projection of Large-Scale Climate Changes Based on Advanced Model Development
Project Leader: Masahiro Watanabe (The University of Tokyo)



Circulation over the Antarctic continental shelf and how it relates to the different sea shelf basal melting modes.

Project Name: Sophisticated Earth System model for Evaluating Emission Reductions Needed
Project Leader: Michio Kawamiya (Research Center for Environmental Modeling and Application, Research Institute for Global Change, JAMSTE)

JAMSTEC: Japan Agency for Marine-Earth Science and Technology

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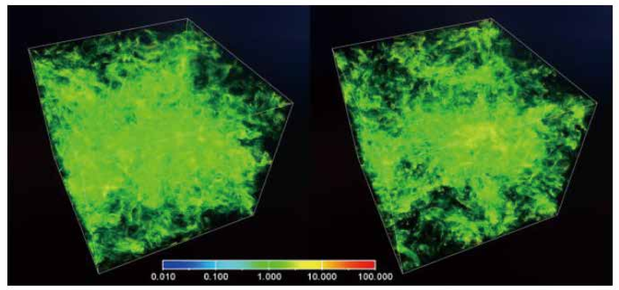
FY2020 Earth SImulator Resource Allocation

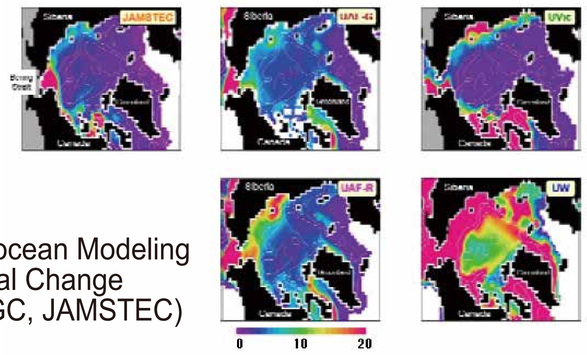
JAMSTEC proposed project:

Projects led by JAMSTEC researchers.



Turbulent energy dissipation rate (512^3 grid points, 4096 parties); (left) PP-BiSM (1-way) and (right) ISM. Color indicates the energy dissipation rate in a logarithmic scale. The VDVGE was utilized for visualization.

Project Name: Numerical Study on Multiphase Turbulent Transport rocesses in Atmospheric and Ocean Flows
Project Leader: Keigo Matsuda (CEIST, VAiG, JAMSTEC)

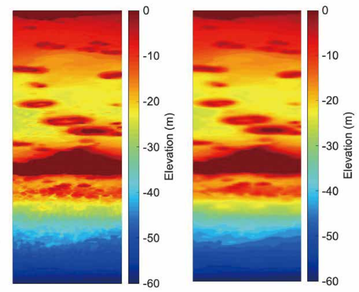


Annual total ice-algal productivity in five models

Project Name: AHigh-resolution Sea Ice-ocean Modeling on the Arctic Environmental Change
Project Leader: Eiji Watanabe (IACE, RIGC, JAMSTEC)

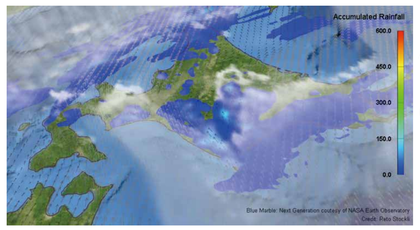
Strategic project with special support:

There are two categories in this field, “Grand Challenge” (deliver significant results accelerated by proactive supports) and “Innovation Challenge” (create innovation in the science field).Both categories accept utilization from JAMSTEC internal and external projects.



Left figure is bathymetry data of 1 m resolution measured at Kume Island based on multibeam echo sounding survey. Right figure is bathymetry of 10 m resolution.

Project Name:Estimating the Attenuation Effect of Tsunami and Storm Wave on Coral Reefs
Project Leader: Masashi Watanabe (Chuo University)



Analysis of spatio-temporal characteristics of heavy rainfall using huge ensemble of high-resolution climate model simulation.

Project Name: Assessment of Flood Risk in Hokkaido Associated with Climate Change
Project Leader: Tomohito Yamada (Hokkaido University)

Fee based usage:

Projects are performed under the confidential for industrial world. Users can make their information and results confidential.

JAMSTEC: Japan Agency for Marine-Earth Science and Technology

CEIST, VAiG: Center for Earth Information Science and Technology, Research Institute for Vaue-AddedInformation Generation
IACE, RIGC: Institute of Arctic Climate and Environment Research, Research Institute for Global Change