



**Title of Project : Multi-Scale Air-Sea Interaction under the East-Asian Monsoon: A ‘Hot Spot’ in the Climate System**

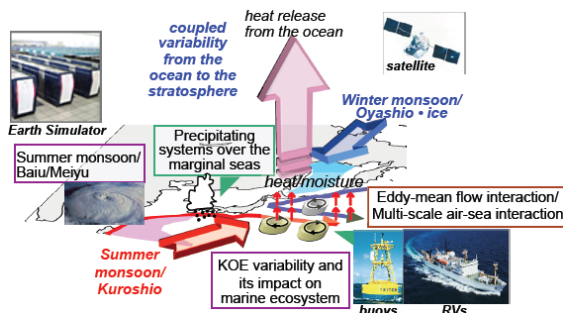
**Term of Project : FY2010-2014**

Hisashi Nakamura  
(The University of Tokyo, Graduate School of Science,  
Associate Professor)

**【Purpose of the Research Project】**

The PI and other core members of the project have recently found several key phenomena that strongly suggest active roles of the mid-latitude ocean, especially, strong western boundary currents (WBCs), in shaping the mean state of the climate and influencing its variability. In particular, we have been focusing on a tremendous amount of heat and moisture released from the narrow, warm WBCs into the atmosphere, postulating the concept of “hot spot” in the climate as concentrated thermodynamical forcing for the atmosphere.

In this project, we attempt to further develop the particular framework we have postulated by focusing on the Far East/ northwestern (NW) Pacific sector, as the most profound “hot spot” in our climate system, where the sharp thermal contrasts form in both meridional and zonal directions under the influence of the East-Asian monsoon and the confluence of the Kuroshio and Oyashio currents. Unifying advanced high-resolution numerical modeling on the Earth Simulator (ES) and new-generation satellite data and conducting in-situ observation campaigns, we aim to deepen our understanding of multi-scale interactive processes involved actively in the air-sea heat and freshwater exchanges and their influence on the climate variability.



**【Content of the Research Project】**

The project team is organized into 9 main programs under the 3 research units as follows.

**[A01-1•2] Multi-scale air-sea interactions over the marginal seas**

Air-sea interaction inherent in the marginal

seas (i.e., the East China Sea, Sea of Japan and Sea of Okhotsk) are investigated, with emphasis on the complex sea-surface temperature (SST) distribution associated with ocean eddies and fronts and their impact on development cloud and precipitation systems associated with rapidly developing cyclones or the Baiu Front.

**[A02-3•4•5•6] Multi-scale interactions in the ocean/monsoon systems over the North Pacific basin and their impact on marine eco-system**

Mechanisms for the formation and long-term variability of the oceanic frontal zone at the boundary of the Kuroshio and Oyashio Extensions are investigated, with emphasis on its interaction with oceanic eddies and its impacts on the air-sea exchanges of heat and fresh water through turbulent and radiative fluxes and on the marine primary production. A02-6 leads the observation campaign.

**[A03-7•8•9] Atmosphere/ocean•sea-ice coupling in the global climate system**

Comprehensive investigations are made on the role of multi-scale air-sea interactions between the Kuroshio-Oyashio system or Okhotsk sea ice and East-Asian Monsoon, as the most pronounced “hot spot”, in the formation and variability in the basin/hemispheric-scale climate system.

**【Expected Research Achievements】**

Substantial advance is expected in our understanding of the multi-scale interactive processes in the Far East/NW Pacific region, which will lead to the substantiation of the active role of mid-latitude ocean in the climate system, a new framework in the climate study.

**【Key Words】**

**oceanic frontal zone:** A narrow maritime region across which SST changes rapidly with high eddy activity. A profound one forms east of Japan with the confluence of the Kuroshio and Oyashio Extensions, along which cyclone development is active in the atmosphere.

**【Homepage Address】**

<http://www-aos.eps.s.u-tokyo.ac.jp/hotspot/>