# Division of Global Environmental Science

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The Division of Global Environmental Science comprehensively plans and promotes research related to weather and climate from the global scale to the urban scale using the global cloud-resolving model “NICAM” with the regional weather model “WRF” and the urban district weather model “LES.”

In addition to four dedicated faculty members, the research division has joint researchers within the university. The resident faculty members are Professor Hiroshi Tanaka, who specializes in global atmospheric science; Professor Hiroyuki Kusaka, who specializes in studying climates familiar to us, such as urban and mountain climates; Assistant Professor Mio Matsueda, who aims to improve the accuracy of weather prediction using ensemble forecasting; and Assistant Professor Quan-Van Doan, who specializes in urban and Southeast Asian climates.

## global-scale numerical weather prediction model NICAM

The **Nonhydrostatic ICosahedral Atmospheric Model (NICAM)** is an atmospheric general circulation model developed jointly by the Atmosphere and Ocean Research Institute (AORI) of the University of Tokyo, RIKEN R-CCS and the Japan Agency for Marine-Earth Science and Technology (JAMSTEC). It has been ported to Oakforest-PACS and is being used as an important research tool. We are using the NICAM to study arctic cyclones, blocking highs, the Arctic Oscillation, and stratospheric sudden warming.

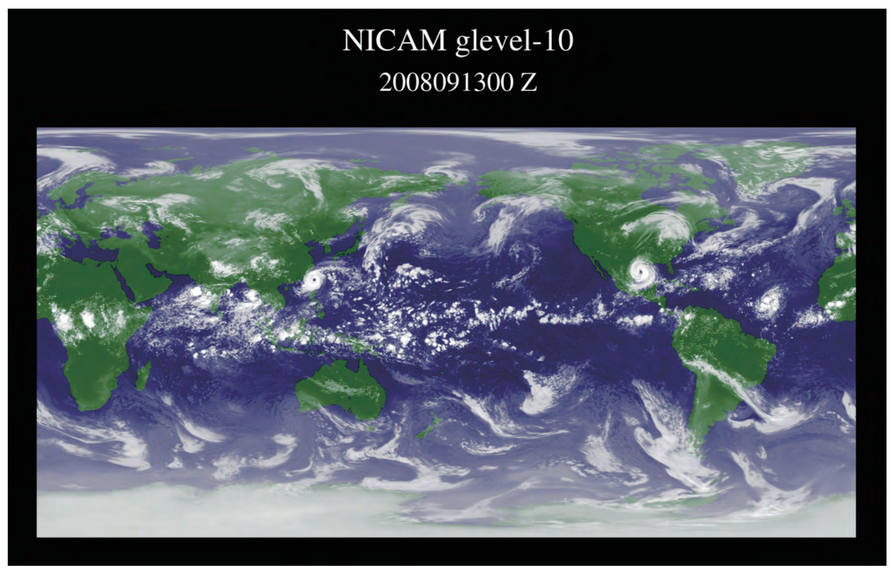


**Fig.1 Cloud image from the NICAM global 7-km resolution model, showing the simultaneous development of Typhoon Sinlaku (2008) and Hurricane Ike (2008)**

## regional-scale numerical wether prediction model WRF

**Fig.2 Cap clouds and mountain-wave clouds appearing over Mt. Fuji.**

The **Weather Research and Forecasting model (WRF)** is a highly versatile numerical weather prediction/simulation model that was developed mainly by the National Center for Atmospheric Research (NCAR) in the United States and released to the public. In this division, we use the WRF to tackle unsolved problems in familiar meteorological phenomena, such as the urban heat island phenomenon, heavy rainfalls, Foehn wind, and cap and mountain-wave clouds in mountains. We are also conducting research on urban climate and projecting the future of heat stroke to address issues in society.

## micro-scale urban meteorological simulation model City-LES

Additionally, we have been developing a micro-scale meteorological model (LES model) with extremely high spatial resolution that can reproduce radiations, temperature, humidity, and wind distributions in urban districts, in collaboration with the CCS’ s Division of High-Performance Computing Systems.

Check it now!

NICAM Movie

City-LES Movie

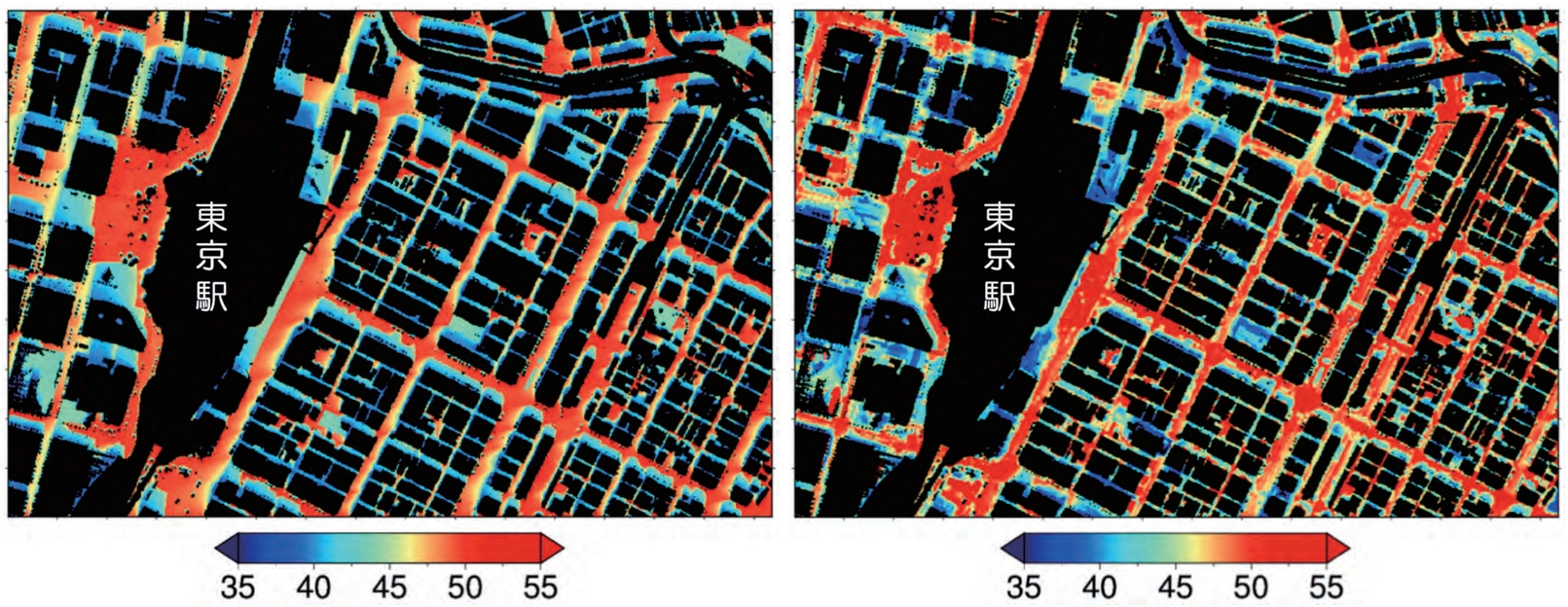


**Fig. 3 Surface temperature distribution around Tokyo Station. Buildings are shown in black. The left figure shows the results of a simulation with the LES model developed by JCAHPC, and the right figure shows the results of helicopter observation by the Tokyo Metropolitan Institute of Environmental Science.**