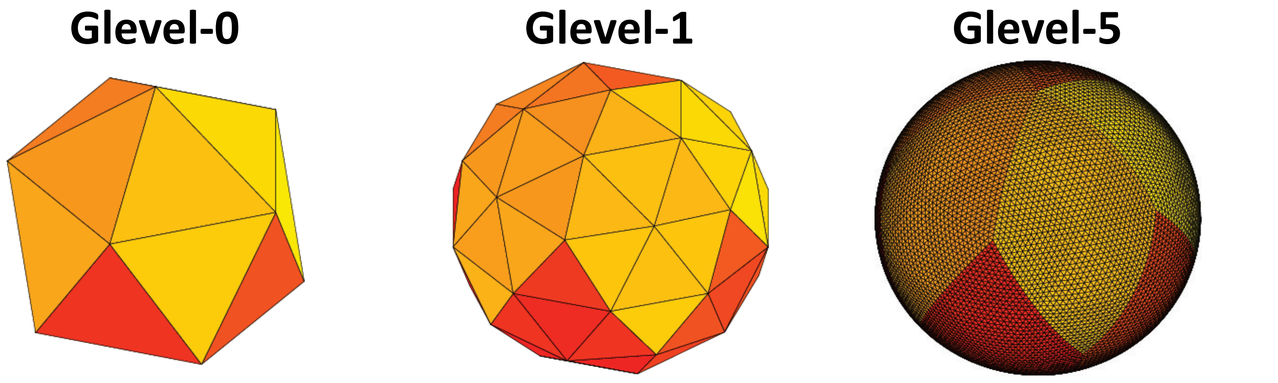
About NICAM

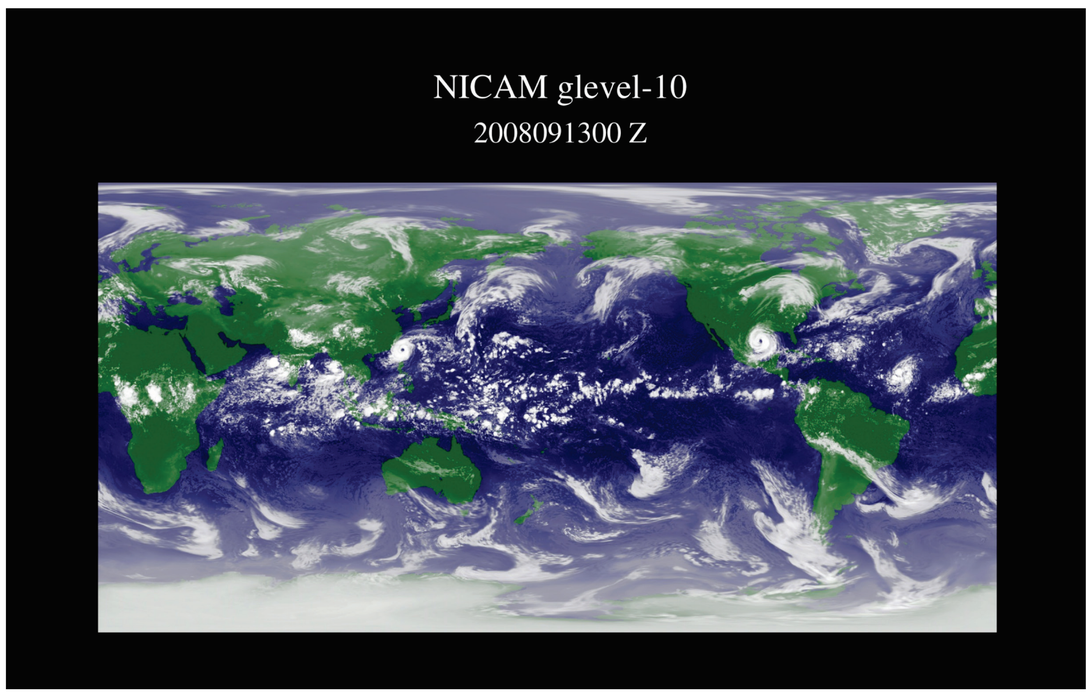
NICAM (Nonhydrostatic ICosahedoral Atmospheric Model) is a new type of ultra-high resolution atmospheric global circulation model. NICAM is designed to perform “cloud resolving simulations” by directly calculating deep convection and meso-scale circulations. Since cores of deep convection have a few km in horizontal size, they have not directly been resolved by existing atmospheric general circulation models.



Glevel-5: Δx = 224 km
Glevel-6: Δx = 112 km
Glevel-7: Δx = 56 km
Glevel-8: Δx = 28 km
Glevel-9: Δx = 14 km
Glevel-10:Δx = 7 km
Glevel-11:Δx = 3.5 km
Glevel-12:Δx = 1.8 km
Glevel-13:Δx = 0.9 km

The original icosahedron consists of 20 triangles, which is called “glevel-0”. By dividing each triangles into four small triangles recursively, one-higher resolution with “glevel-n” is obtained (Fig. 1). The total number of grid point is 10x(2n)2+2.

Simulation of Atmospheric General Circulation by Global Cloud Resolving Model, NICAM



NICAM is able to reproduce the multi-scale cloud systems realistically, cumulus convection, Tropical cyclones, Arctic cyclones, the Madden–Julian Oscillation (MJO), and Intertropical Convergence Zone(ITCZ).

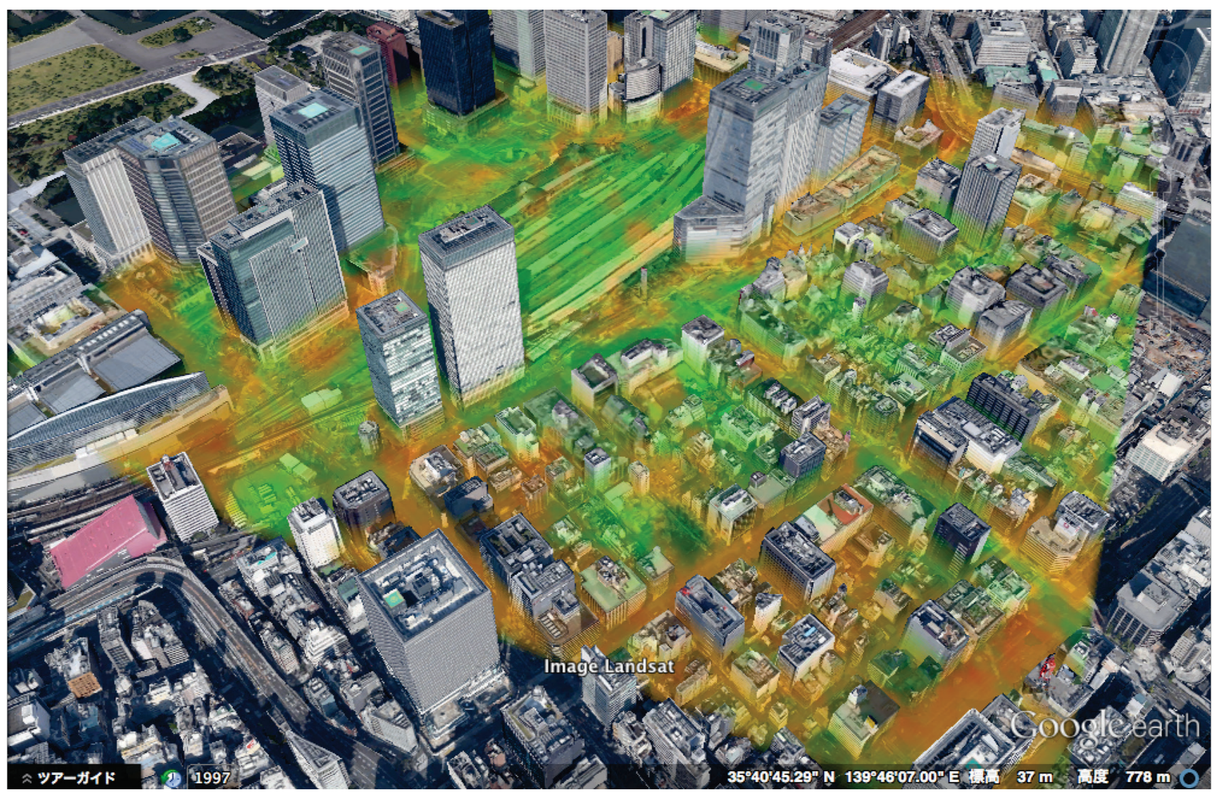
In Fig. 2, NICAM with glevel-10 (7-km horizontal resolution) well simulates Typhoon Shinraku near the Philippine Islands and Hurricane IKE near the Gulf of Mexico.

Development of LES Model for thermal environment at city scale

Our group has been developing a Large Eddy Simulation (LES) model for urban environment. The main features of the model include (i) Building resolving, (ii) Roadside trees are resolved in vertical direction, (iii) Multiple reflections of short- and long-wave radiation between buildings and trees by radiosity method, (iv) resolving shadows from buildings and trees, and (v) incorporation of cloud physics and atmospheric radiation models (e.g., RRTM).

Numerical simulation of thermal environment around Tokyo station was conducted using COMA supercomputer. The total number of grid points is about 100 million. Figure 3 shows surface air temperature distribution. The result shows that the surface air temperature in low sky-view factor area is higher than high sky-view factor area.

We plan to perform sensitivity analyses, impact evaluations, and future projections of urban thermal environment at city-scale, using our LES model.



Volume Data Visualizer for Google Earth (VDVGE) was used in drawing this figure.