

LES on Wind Pressure Acting on High-rise Building under Strong Wind Events of Typhoon

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Recently, extreme large typhoon attacks urban city and the damage of building structure occurs. For estimating damage of high rise building, the structural response and wind pressure on attachment of building are revealed by using wind tunnel experiment and CFD techniques. In most of cases, inflow conditions using turbulent boundary layer which develops on smooth or roughness surface are used. However, in the most of cases of strong wind events, disturbance derived from meteorological field with change of air density and temperature affects the characteristics on peak value and fluctuation of wind pressure on buildings. Now, it is possible to reproduce meteorological turbulent structure of Typhoon by meso-scale meteorological model. Large computation with spatial resolution less than 100 m makes it possible to show fine spatial structure with several hundred meters scale and velocity fluctuation with several ten seconds. In addition, techniques for generating inflow condition with high-frequency fluctuation which is important for estimating unsteady change of wind pressure are developed.

This study clarifies the effect of meteorological disturbance on wind pressure of high-rise building by comparing the computational cases which are different in 2 inflow conditions respectively. The one is inflow condition based on turbulent boundary layer and the other is inflow condition based on the meteorological field of Typhoon. For the inflow condition based on the meteorological field, turbulence of actual urban canopy is also included by CUBE (developed by RIKEN R-CCS) [1] computation for large urban area. Then, the generated inflow data are connected to the calculation domain of tetrahedral unstructured grid and wind pressure on actual high-rise building. Finally, the effects of large-scale fluctuation derived from meteorological disturbance on wind pressure of high-rise building are revealed.

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