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論文要約

THESIS OUTLINE

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要約
Thesis Outline

LES analysis for surface pressure of buildings affected by complex terrain

The aim of this study is to investigate the effects of real complex terrain and surrounding buildings on the distribution of unsteady surface pressures on and the formation of flow structures around buildings. Due to the rapid development of computational technology during recent decades, LES application to complex flow configuration is becoming more and more common. In this thesis, polyhedral-grid LES is applied and validated over real complex terrain. Chapter 2 introduces the LES method applied in this thesis including the mesh generation.

First, the LES models start by simulating simplified models before carrying out the study of real cases (Chapter 3): a surface-mounted cube and that on a slope with 10°/15° for orientation of 45°. The accuracy of LES using polyhedral grid is validated by comparison of the surface pressure distribution on the cube on flat floor with previous experiment data. For the effects of the slope terrain, two cases of slope with an inclination of 10° and 15° are conducted to show the effects on the switching pattern and intensity of the conical vortex and the resulting pressure fluctuation.

Then, Chapter 4 reproduces a high-rise building on a flat topography, on the real complex topography, and that with surrounding buildings, are discussed to show the effect of the actual terrain. The statistical pressure characteristics of the mean, fluctuating, and peak values on the surfaces of the target building are elucidated. The comparison results showed that the LES method accurately and efficiently predicts the surface pressure distributions on the high-rise

buildings. The typical conical vortex on the sides of the high-rise building is reproduced and investigated. Although the estimated peak negative pressures on the trailing part of the flow-separation region tended to be underestimated when the terrain was added, the peaks on other surfaces, including the leeward surface, are well estimated. This means pressure records predicted by the LES method are generally equivalent to the experimental data, even with a relatively short duration of pressure samples. The peak negative pressure estimation results in the separation zone are more sensitive to grid resolution near the complex terrain than the mean and fluctuating pressures. However, the difference in the estimated peak values between these two methods was within 20%. Complex terrains, such as concaves, slopes, and narrow areas generated between the building and terrain, and surrounding buildings have a significant effect on the pressure distributions of the building surface.

備考：論文要旨は、和文 2000 字と英文 300 語を 1 部ずつ提出するか、もしくは英文 800 語を 1 部提出してください。

Note: Thesis Summary should be submitted in either a copy of 2000 Japanese Characters and 300 Words (English) or 1 copy of 800 Words (English).

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