

# **Spectrum Characteristics of Fluctuating Wind Pressures on Hemispherical Domes**

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## **Abstract**

A large span roof is one of the common designs for modern structures, such as sport stadiums, coal/oil storage, museums, or certain symbolic structures standing for religious or national meanings. The most concerned of such design is its curved geometry and its sensitivity to wind loads. For the past three decades, many works have been published to investigate the aerodynamic characteristics on hemispherical domes. However, only limited description was given on discussing spectrum characteristics. Systematic wind tunnel tests were carried out to investigate the spectrum characteristics of fluctuating wind pressures on the surface of hemispherical domes due to Reynolds number effects in both smooth and turbulent wind flows. Reynolds number in this study varies from  $6.6 \times 10^4$  to  $1.9 \times 10^6$  to have a wider range for discussion. Instantaneous fluctuating wind pressures were measured and processed FFT for spectrum calculation. Power spectra and cross spectra between two pressures along the meridian were selected for examination. It was observed that not only the location but also the distance difference between two pressures can significantly affect the spectrum distribution. From upstream to downstream, power spectra vary gradually as separation occurs and forms a wake region. With the increase of Reynolds number, coherence varies significantly in the lower reduced frequency range. Oncoming turbulence intensities somehow enhance the wave form distribution over all frequency ranges. However, it is also mentioned that a quantitative description may help more in defining how spectrum characteristics affect the wind loadings on the surfaces.

## **Speaker's Background**

Ph.D., Dept. of Socio-cultural Environmental Studies, University of Tokyo (2009.4~2012.3)

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Main researches on wind engineering, wind tunnel tests, and design wind speeds