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回転するファンブレードから発生する 空気力学的騒音源の可視化

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Visualization of Aerodynamic Noise Source around a Rotating Fan Blade

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本研究は、回転するファンブレードから発生する流体力学的騒音分布を明らかにすることを目的とし、先に著者らが開発したPIV（粒子画像流速計測法）をベースにした騒音信号と速度変動の相関解析法をこの種の流れ場に適用することで、音源分布を可視化する方法を提案した。本研究の概要は以下のとおりである。

Abstract

The purpose of this study is to understand the aerodynamic noise source distribution around a rotating fan blade by measuring the noise signal and velocity field around the blade. The local noise-level distribution over the fan blade is measured by microphone arrays, and the flow field is visualized by

smoke and phase-averaged PIV measurement. The noise source distribution is examined by cross-correlation analysis between noise signal and velocity fluctuation. It is found that the noise source is found near the rotating fan blade, especially around leading and trailing edges. The separation and reattachment of flow are observed near the leading edge, and the tip vortices and vortex shedding are found near the trailing edge. The cross-correlation distribution of the noise signal and the radial velocity fluctuation shows large magnitude in the correlated regions, which indicates the noise generation by the formation of vortex structure around the blade.