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平壁面附着颗粒脱离前的湍流诱导共振

摘要

颗粒再悬浮是自然界和工业过程中的常见现象，但其机理尚未被充分理解。本文报道了壁面附着颗粒在脱离前发生湍流诱导共振的直接实验证据。实验记录到的共振频率比通常由 Rock n'Roll 模型预测的频率低 1–2 个数量级。研究发现，颗粒黏附固有频率与近壁湍流频率之间的频率比 φ，是决定湍流诱导共振是否发生的关键参数。该研究有望为利用共振增强机制清除极小颗粒提

关键词

颗粒再悬浮；湍流诱导共振；临界频率比

Abstract

Particle resuspension is a common phenomenon in nature and industries but not fully understood yet. In this work, we report direct
experimental evidence for turbulence-induced resonance of wall-adhered particles before detachment. The recorded frequency is one or two
orders of magnitude lower than that normally predicted by the Rock n'Roll model. The frequency ratio /, between the natural frequency of
particle adhesion and wall turbulence frequency, is found to be the key parameter that determines the occurrence of turbulence-induced reso
nance. This work may shed light on the resonance-enhanced cleaning of very small particles.

Keywords

particle resuspension; turbulence-induced resonance; critical frequency ratio

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