KOLLOQUIUM ÜBER NEUERE ARBEITEN AUF DEM GEBIETE
DER MECHANIK UND STRÖMUNGSLEHRE
an der Technischen Universität Wien

EINLADUNG

zum Vortrag von Herrn

Dr. Kristján GUDMUNDSSON
Physics of Fluids Group, Applied Physics Department
University of Twente, NL

über

"Instability Wave Models of Turbulent Jets from Round and Serrated Nozzles"

Zeit: Donnerstag, 18. November 2010, 16 Uhr c.t.

Ort: SEM 322
Institut für Strömungsmechanik und Wärmeübertragung
Resselg. 3, Stiege 2, 1. Stock, 1040 Wien

“Instability Wave Models of Turbulent Jets from Round and Serrated Nozzles”

Dr. Kristján GUDMUNDSSON

We study pressure fluctuations associated with large-scale coherent structures in turbulent round and serrated jets. Linear disturbances to the turbulent mean flow of the round jet are modeled via linear stability analysis and the Parabolized Stability Equations (PSE). We show that PSE provides better agreement with near-field microphone-array data at low frequencies than previous models based on linear stability theory. We examine the extent to which microphone data is contaminated by fluctuations uncorrelated with large-scale structures. By filtering out the uncorrelated fluctuations, via the proper orthogonal decomposition (POD), better agreement between data and theory is obtained. We further demonstrate the influence of large-scale structures by comparing predictions with velocity measurements taken inside the turbulent jet. We next extend the linear stability analysis of round jets to include the effects of azimuthal inhomogeneities of serrated jets. We solve the resulting system of equations and find new modes, associated with the streamwise vorticity of the serrated-jet mean flow. All unstable modes of the serrated jet are stabilized, potentially explaining the noise reduction achieved by such jets. We also compare these predictions to POD-filtered microphone measurements, generally finding good agreement.