Technion-Israel Institute of Technology
Faculty of Mechanical Engineering

הטכניון-מכון טכנולוגי לישראל
הפקולטה להנדסת מכונות

סמינריון

הנך מוזמן/ת להרצאה סמינריונית של הפקולטה להנדסת מכונות שתתקיים ביום ה' 27.12.2018
(יט' בטבת, תשע"ט), בניין דן קאהן, אודיטוריום 1, 13:30.

מרצה: סופי קופרמן

מנחה: פרופ"מ רנה ואן האוט

על הנושא:

מדידות של דינמיקה של סיבים כבדים בעלי אינרציה בזרימה טורבולנטית איזוטרופית

Measurement of the dynamics of inertial, heavy fibers in isotropic turbulence

The seminar will be given in Hebrew

תקציר ההרצאה:

Particle-flow interactions are common in many environmental, industrial and health related processes such as wind or water erosion, plankton movement in the ocean, spray-based oral drug delivery as well as in combustion processes, amongst others. Most flows occurring in industrial applications and in nature are turbulent. The interaction between anisotropic particles (such as fibers) and isotropic turbulence is significant in high Reynolds number turbulent flows at the smallest scales where the turbulence may be considered isotropic. Published research regarding the topic consists mostly of numerical simulations and there is a lack of experimental data.

Here, rotational and translational dynamics of rigid, heavy fibers in air isotropic turbulence were measured using two orthogonal view, holographic cinematography. Measurements were conducted in a turbulence chamber (Re_λ = 115). Several batches of nylon fibers with different diameters and lengths were investigated resulting in Stokes numbers ranging between $1.0 < St < 32.5$, and fiber length to Kolmogorov length scale ratios ranging between $3.6 \leq L/\eta_k \leq 17.3$. Fiber inertia (as indicated by St) decreased the response of the fibers to the fluctuating air velocities and ratios of the rms values of fluctuating fiber centroid velocities and air velocities dropped from 0.96 to ~0.77 for the highest St. Furthermore, with increasing St, probability density functions (PDF's) of fiber centroid velocities that were well described by a normal distribution, narrowed in comparison to the those of the air velocity. PDF's of in-plane fiber rotation rates could not be described by a normal distribution. In the absence of significant length effects, fiber rotation rates were governed by St. Our results indicate that the fibers' "tumbling" rate peaks around $St \approx 4$, most likely as a result of reduced fiber alignment with the vorticity vector compared to fibers having lower St. At the highest investigated St, decreasing "tumbling" rates are the result of increasingly limited response to the fluctuating flow field.

בברכה,

פרופ"מ מתיו סאסו
מרכז הסמינרים