UNIVERSITÄT BAYREUTH

TECHNISCHE MECHANIK UND STRÖMUNGSMECHANIK TMS

Master thesis proposal

Particle resuspension by turbulent impinging jets

Chair for Applied Mechanics and Fluid Dynamics, Universität Bayreuth

Description In fluid dynamics, resuspension refers to the process by which particles, previously airborne and then deposited on a surface, are removed and picked up under the action of a flow. This phenomenon occurs widely both in nature and industry: it is a matter of concern in environment, soil and forensic science, filtration technology, chemistry, biology, sedimentology and energy industry. The modeling and prediction of particle resuspension is also critical to space exploration missions, where dust particles lifted up during landing (by a flow modellable as an impining jet flow) may form a cloud around the exploration rover, preventing visibility and/or causing damages. In the same context, impinging jets are used to clean up the PV panels of the rovers in order to keep them functional and efficient for the whole duration of the mission. In the first case a reduction of the amount of resuspended dust is desired; in the second, an increase of it. Despite the great interest in the phenomenon, available models are still not comprehensive or not fully validated by experiments.

Objective The proposed thesis project can be either experimental or numerical. The experimental project consists in the validation of a resuspension model previously developed at Prof. Sesterhenn's research group.[1] Experimental data measured in a vacuum chamber shall be compared against preexisting DNS data. The numerical project targets the improvement of the current model by removing, for example, the assumption that the deposit layer thickness is negligible.

Requirements Intermediate programming skills, knowledge of the numerical analysis, fluid dynamics and computational fluid dynamics (CFD) are desired requirements. Prior knowledge of one or more of the following programming languages is considered particularly advantageous: `Julia`, `Python`, `Fortran`, `C/C++`.

Duration The estimated duration of the thesis project is 6 months.

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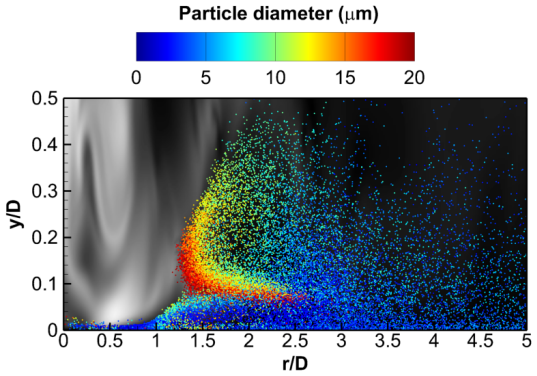

Figure 1: Particles resuspended by a turbulent impinging jet, colored by their diameters.[1]

[1] G. Camerlengo *et al.*, *Flow, Turbulence and Combustion* **101**, 247–267 (2018).