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Master thesis – numerical

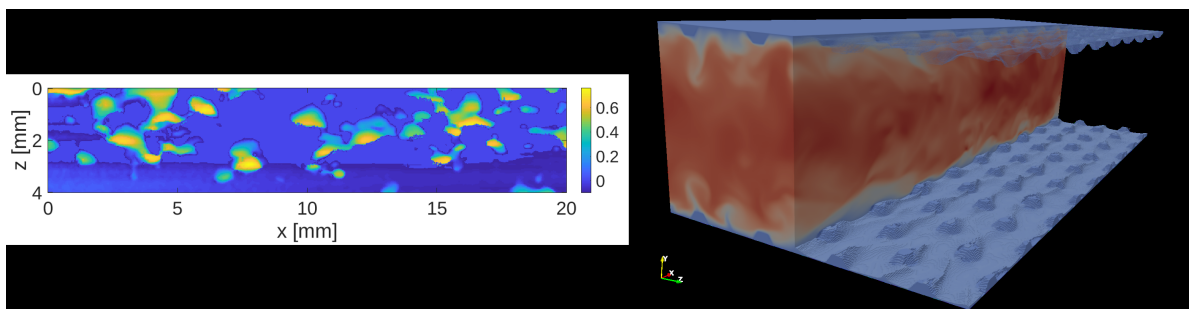
Simulation of flow over anisotropic pseudo-random rough surfaces

Background

Flow over rough surfaces occurs in a wide range of engineering applications. The performance of a flow-related equipment can be considerably altered due to the increased momentum transfer induced by roughness. In recent years, isotropic roughness has drawn the most research interest in this field. However, considerable number of realistic applications - e.g. ice accretion on aeroplane, see figure below - show anisotropy in roughness distribution, which is one of the significant factors altering the roughness effect on the flow and heat transfer. In this thesis, a mathematical anisotropic roughness generation method is planned to be developed and evaluated. The physics of flow over systematically varied anisotropic roughness will be analyzed.

Content of the Thesis

Within the scope of this master's thesis, the turbulent flow over anisotropic irregular rough surfaces is investigated. A systematic approach for generating anisotropic random roughness will be developed for this purpose. The roughness generation method will be validated by reproducing a realistic roughness with anisotropic properties. The investigation of turbulent flow over rough surfaces is carried out with the available spectral DNS code SIMSON. The simulation domain is illustrated by the figure on the right side. Flow statistics, e.g. mean velocity profile, Reynolds stress etc., as well as instantaneous flow field will be analyzed within the scope of the thesis.



Requirements

basic knowledge in fluid mechanics and programming

Beneficial Skills

Matlab, Linux

Start: immediately

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