

Influence of surface anisotropy on turbulent flow over irregular roughness - dataset

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Surface and velocity data discussed in the paper

[1] Angela Busse and Thomas O. Jelly, *Influence of surface anisotropy on turbulent flow over irregular roughness*, Flow, Turbulence and Combustion (accepted in August 2019)

is made available to the public. The reader is referred to [1] for a fully detailed description of the dataset and the methods used for its generation.

Contents of the database

The database contains representations of the nine surfaces studied in the paper named S_{118} , S_{18} , S_{14} , S_{12} , S_{11} , S_{21} , S_{41} , S_{81} , and S_{161} . In addition, velocity statistics (mean streamwise velocity profiles, Reynolds and dispersive stress statistics) are included in this dataset.

Surfaces

Surfaces S_{18} , S_{14} , S_{12} , S_{11} , S_{21} , S_{41} , and S_{81} share the same domain size in the streamwise and spanwise direction ($8\delta \times 4\delta$). The heightmaps of these surfaces are given in the form of a `.csv` file named `heightmaps.csv`. The first column contains the streamwise coordinate x_1 and the second column the spanwise coordinate x_2 on the surface. Columns three to nine contain the height of the different surfaces at the corresponding location (x_1, x_2) in the order S_{18} (column 3), S_{14} , S_{12} , S_{11} , S_{21} , S_{41} to S_{81} (column 9).

Surfaces S_{118} and surfaces S_{161} have different domain sizes and their heightmaps are therefore given in individual files. The height coordinates for surface S_{118} are contained in `heightmap_AR_1_to_18.csv` and the coordinates of S_{161} in `heightmap_AR_16_to_1.csv`. The files follow the same structure as the `heightmaps.csv` file.

All coordinates and heights are given in units of the mean channel half-height δ as described in the paper [1].

Mean streamwise velocity profiles, Reynolds and dispersive stress statistics

For each surface a `.csv` is given that contains the mean velocity profile and Reynolds and dispersive stress statistics. The following naming convention is applied: `vel_profiles_*.csv` where `*` is replaced by the corresponding surface name, e.g., the data for surface S_{41} is contained in `vel_profiles_S41.csv`. The column layout is given in table 1. A file named `vel_profiles_ref.csv` contains the corresponding data for the smooth-wall reference case using the same column layout excluding columns 8 to 11 as dispersive stresses are not defined for the smooth-wall case.

column	1	2	3	4	5	6	7
contents	z^+	z/δ	$\langle \bar{u}_1 \rangle^+$	$\langle u_1'^+ u_1'^+ \rangle$	$\langle u_2'^+ u_2'^+ \rangle$	$\langle u_3'^+ u_3'^+ \rangle$	$\langle u_1'^+ u_3'^+ \rangle$
column				8	9	10	11
contents				$\langle \tilde{u}_1^+ \tilde{u}_1^+ \rangle$	$\langle \tilde{u}_2^+ \tilde{u}_2^+ \rangle$	$\langle \tilde{u}_3^+ \tilde{u}_3^+ \rangle$	$\langle \tilde{u}_1^+ \tilde{u}_3^+ \rangle$

Table 1: Column layout of `vel_profiles_*.csv` files.