Reynolds number dependence of Reynolds and dispersive stresses in turbulent channel flow past irregular near-Gaussian roughness - dataset

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Surface and velocity data discussed in the paper

[1] Thomas O. Jelly and Angela Busse, *Reynolds number dependence of Reynolds and dispersive stresses in turbulent channel flow past irregular near-Gaussian roughness*, International Journal of Heat and Fluid Flow, (accepted in September 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 near-Gaussian surface studied in the paper at friction Reynolds numbers 180, 240, 360 and 540, as well as reference smooth-wall data. In addition, velocity statistics (mean streamwise velocity profiles, Reynolds and dispersive stress statistics) are included in this dataset.

Surfaces

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

The surface has a domain size in the streamwise and spanwise direction of $(6\delta \times 3\delta)$. The surface heightmaps at each friction Reynolds are given in the form of a `.csv` file. The following naming convention is applied: `heightmap_*.csv` where * is replaced by the corresponding friction Reynolds number, e.g., the data at a friction Reynolds number of 180 is contained in `heightmap_R180.csv`. The first column contains the streamwise coordinate x_1 and the second column the spanwise coordinate x_2 on the surface. The third column contains the height of the surface at the corresponding location (x_1, x_2).

Mean streamwise velocity profiles, Reynolds and dispersive stress statistics

For each friction Reynolds number 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 friction Reynolds number, e.g., the data at a friction Reynolds number of 180 is contained in `vel_profiles_R180.csv`. The column layout is given in table 1. A file named `vel_profiles_ref_*.csv` contains the

column	1	2	3	4	5	6	7
contents	z^+	z/δ	$\langle \overline{u}_1 \rangle^+$	$\langle \overline{u_1'^+ u_1'^+} \rangle$	$\langle \overline{u_2'^+ u_2'^+} \rangle$	$\langle \overline{u_3'^+ u_3'^+} \rangle$	$\langle \overline{u_1'^+ u_3'^+} \rangle$
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.

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.