

# Documentation for Research Dataset

## Introduction

This dataset contains surface and velocity data for the following article:

Sarakinos, S. and Busse, A. (2022) Investigation of rough-wall turbulence over barnacle roughness with increasing solidity using direct numerical simulations. *Physical Review Fluids*, 7(6), 064602. (doi: 10.1103/PhysRevFluids.7.064602)

## Surface data

Surface data is contained in the file named `SurfaceData.csv`. The first column contains the streamwise coordinate  $x$  and the second column the spanwise coordinate  $y$ . The third to ninth columns contain the surface height  $h(x, y)$  for the different surfaces in order of increasing coverage, i.e., the height data for the 10% case is contained in column 3 and the height data for the 85% case is contained in column 9. All spatial locations are normalised with the mean channel half-height.

## Velocity statistics

For each surface a different velocity data file is provided. The naming convention is as follows: `VelocityData_*.csv` where  $*$  is replaced by `10pc`, `15pc`, ..., `85pc` for the different coverage states and by `smooth` for the smooth-wall case. The column layout is given in Table 1. The intrinsic average is applied for computation of the velocity data, i.e., averages are taken over the fluid occupied area only. All velocity data are normalised with the friction velocity which is based on the constant mean streamwise pressure gradient and the mean channel half-height.

Table 1 Column layout for velocity statistics files

Column	Contents	Comments
1	$z/\delta$	Wall-normal location
2	$\langle \bar{u} \rangle$	Mean velocity
3	$\langle \bar{u}'u' \rangle$	Streamwise normal Reynolds stress
4	$\langle \bar{v}'v' \rangle$	Spanwise normal Reynolds stress
5	$\langle \bar{w}'w' \rangle$	Wall-normal Reynolds stress
6	$\langle \bar{u}'w' \rangle$	Reynolds shear stress
7	$\langle \bar{u}\tilde{u} \rangle$	Streamwise dispersive stress ( <i>not applicable for smooth-wall case</i> )
8	$\langle \bar{v}\tilde{v} \rangle$	Spanwise dispersive stress ( <i>not applicable for smooth-wall case</i> )
9	$\langle \bar{w}\tilde{w} \rangle$	Wall-normal dispersive stress ( <i>not applicable for smooth-wall case</i> )
10	$\langle \bar{u}\tilde{w} \rangle$	Dispersive shear stress ( <i>not applicable for smooth-wall case</i> )

## Further information

In case of questions about this dataset, please contact the authors.