Dataset description

Turbulent Ekman flow ($Re_D = 1600$, $Ri = 0$)

Direct numerical simulation – Set-up and vertical profiles

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1 Metadata

Collection This data set is part of the collection *Turbulent wall-bounded flow*[2].

The collection is freely available and hosted by Refubium, the institutional repository of Freie Universität Berlin.

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HPC systems The data was generated under the project `HKU24`, `STADIT` and `TrainABL` on the supercomputer `JUWELS` at John-von-Neumann Institute for Computing (NIC) at Forschungszentrum Jülich (Germany) and `HAWK` at Höchstleistungsrechenzentrum (Stuttgart) respectively.

Code The data was generated by the tool-suite for turbulence simulation tLab[3]

2 The dataset

2.1 Contents

The dataset files, collectively named with grid information and the date of creation of the data on the High-Performance Computing (HPC) system. Each file of the collection contains time-series of a namelist files name dns.ini which is a plain text file holding the configuration of the tLab code (for documentation, please refer to Open-source code available under github.com/turbulencia/tlab).

2.2 Physical case

This case of simulation conducted with a Reynolds number (Re) of 1600, corresponding to a friction Reynolds number Re_τ of 2978, delves into the study of the turbulent flow. Utilizing a computational grid measuring 3860 x 7680 x 960 collocation points with a spatial resolution

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[2] refubium.fu-berlin.de/handle/fub188/42710

[3] github.com/turbulencia/tlab

of $8.6 \times 4.3 \times 1.00$ wall units, the domain size is scaled to $L_x = L_y = 0.54\ \Lambda$, where Λ is the Rossby radius.

2.3 Variable information

The statistical data is available in self-documented netCDF format, and it contains a wide array of parameters, encompassing vertical profiles of velocity and scalar variables (temperature/buoyancy as active and for some cases also passive scalars), scalar and momentum budget terms, as well as statistical moments up to the fourth order of velocities, scalars, and derivatives. These parameters provide a comprehensive perspective on Ekman flow dynamics. They are organized into distinct groups. Within the subsequent table, you will find numerous variables grouped together, accompanied by their descriptions and associated equations.