

Large Eddy Simulation of a confined planar jet opening in a rectangular channel

Binayak Lohani

Department of Mechanical and Aerospace Engineering
Pulchowk Campus, Nepal

Abstract

The primary aim of the paper is to simulate the laminar-turbulent transition of confined planar jet opening in a rectangular channel using Large Eddy Simulation (LES), as implemented in OpenFOAM. LES is used to resolve the large eddies and model the small eddies present in the flow. The case depicts the duct flow which has multiple applications in engineering and science such as pipe flow, HVAC systems, rectangular exhaust nozzles in aircraft connecting engine and nozzle, etc. A sub-grid turbulence modelling called Smagorinsky model using Van Driest damping function is considered in the problem. Due to the increasing interest of LES to simulate the flow in research and industries, the familiarity with the usage of this method is important. Hence, it is important to study and analyze the location of fully developed turbulent flow for a given domain and collect the mature mean and statistics from the flow.

1 Problem Statement

In order to study the behaviour of a confined planar jet opening in a rectangular channel, proper dimensions need to be considered to achieve the fully developed turbulent flow. The dimensions of the channel is described in table 1. The simulation method used is LES using Smagorinsky model in OpenFOAM with Van-Driest damping function.

Table 1: Dimensions of the channel

	Length of channel (L)	Width of channel (S)	Height of channel (W)	Height of planar jet inlet (D)
Dimensions (mm)	Variable (to be determined)	40	10	5

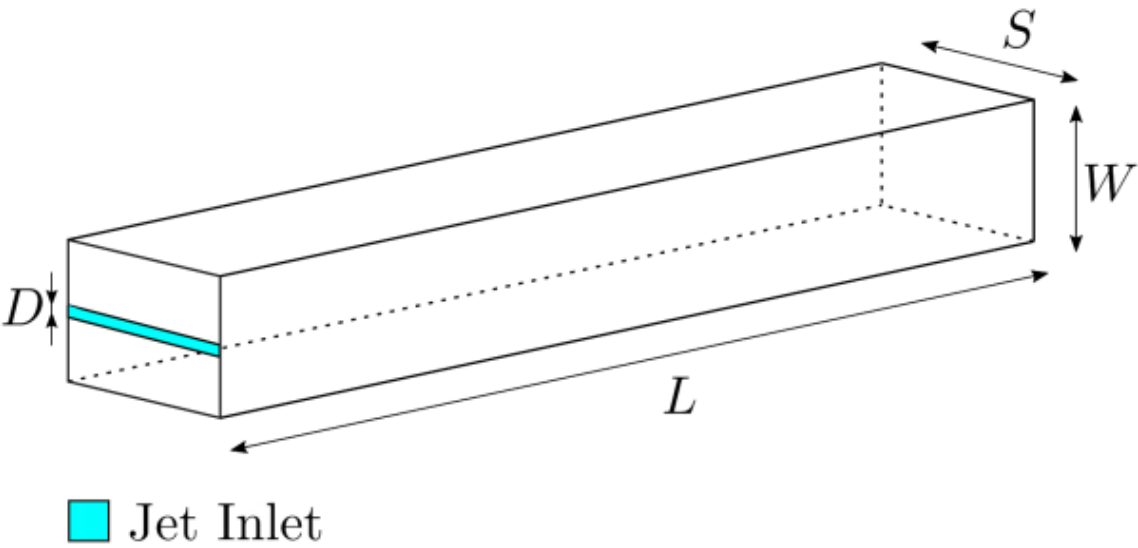


Figure 1: Geometry of the channel