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### **ACCEPTED MANUSCRIPT**

## Experimental verification of the turbulence models for the pressure diffusion process in a turbulent plane jet

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#### Abstract

We performed simultaneous measurement of the three velocity components and the pressure in a plane turbulent jet as well as the verification of turbulence models related to the pressure diffusion process, such as gradientdiffusion-model and the model for the rapid and slow terms of the pressure diffusion term. The results show that the gradient-diffusion-model developed in the previous studies are valid in the region where the turbulent intensity and the turbulent/non-turbulent intermittency are high and the production of the turbulent energy is dominant to the other processes such as the convection and diffusion of the turbulent energy in the turbulent energy budget. In addition, the pressure diffusion of the turbulent energy cannot be modeled accurately by using only the slow term, and its accuracy increases by considering both rapid and slow terms in the model. These results indicate that the modeling of the pressure diffusion process using only the slow term has a certain risk for causing a misunderstanding of the turbulent energy transport process.

*Keywords:* Simultaneous measurement, Pressure measurement, Pressure diffusion, Turbulence model, Plane jet

#### 1. Introduction

Estimating the pressure-related terms in the turbulence energy transport equation and the Reynolds stress equation involves difficulties and uncertainties in experiments. Therefore, they are often neglected or estimated indirectly using assumptions in the previous studies [1] [2] [3] [4] [5]. However, due to the recent development of measurement techniques and numer-

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