Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Quantitative evaluation on contributions of laminar, turbulence and secondary flow to momentum and heat transfer in rhombic ducts
NAOYA FUKUSHIMA, Tokyo University of Science — In the present study, Direct Numerical Simulation of turbulent flow in rhombic ducts have been carried out to investigate effects of the corner angle on the friction and heat transfer. Due to secondary flow of the second kind, the friction and heat transfer are enhanced in the corner, while turbulence enhances momentum and heat transfer near the wall away from the corner. In previous studies, turbulence and secondary flows are supposed to enhance momentum and heat transfer, qualitatively. The quantitative estimation of their contribution has not been clarified yet. Fukagata, Iwamoto and Kasagi (2002) have theoretically driven the FIK-identity to evaluate quantitative contributions of laminar and turbulence to the friction in turbulent channel. In this study, the FIK-identity has been numerically applied to DNS data in the rhombic ducts to evaluate quantitative contributions of laminar, turbulence and secondary flow to the momentum and heat transfer. From the results, it is quantitatively clarified that the contributions of turbulence and secondary flow to heat transfer are larger than that to friction in the rhombic ducts.

Naoya Fukushima
Tokyo University of Science

Date submitted: 02 Aug 2016 Electronic form version 1.4