

Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Relationships between the eigen-vortical-axis line and the vortex stretching in an isotropic homogeneous turbulence HAYATO HORI, Graduate School of Engineering, Aichi Institute of Technology, KATSUYUKI NAKAYAMA, Department of Mechanical Engineering, Aichi Institute of Technology — The present study investigates the relationships between the eigen-vortical-axis line and the vortex stretching in an isotropic homogeneous decaying turbulence in a low Taylor Reynolds number. This axis line has been proposed as a vortical axis based on the invariant local flow topology and shown that it has stronger characteristics to pierce intense vortical regions than the vorticity line. The vortex stretching can be classified into (1) ineffective stretching that increases vorticity parallel to the swirl plane and (2) effective stretching that increases the orthogonality of the vortical axis and develops a vorticity component associated with swirling. The characteristics of the vortex stretching in a vortical axis are analysed focusing on the effective stretching and an angle between the directions of the vortical stretching and the local axis. Furthermore, it is analysed that the influence of the vortex stretching to the local axis geometry that is defined by the eigenvalues in terms of the gradient of the local axis direction and shows the behavior of the axis line, e.g., twist and convergence. These analyses show that the eigen-vortical-axis line has higher correlation with respect to the effective stretching than the vorticity line.

Hayato Hori
Graduate School of Engineering, Aichi Institute of Technology

Date submitted: 01 Aug 2019

Electronic form version 1.4