An open source Matlab$^{®}$package for solving Fokker-Plank Equation and validation of Integral Fluctuation Theorem[1] ANDRE FUCHS, Institute of Physics and ForWind, University of Oldenburg, Germany, SWAPNIL KHARCHE, IRIG-DSBT, UMR CEA-Grenoble University, CEA Grenoble, France, MATTHIAS WAECHTER, JOACHIM PEINKE, Institute of Physics and ForWind, University of Oldenburg, Germany — We present a user-friendly open-source Matlab package developed by the research group Turbulence, Wind energy and Stochastics (TWiSt) at the Carl von Ossietzky University of Oldenburg. This package enables to perform a standard analysis of given turbulent data and extracts the stochastic equations describing the cascade process in turbulent flows through Fokker-Planck equations. As the analysis of the scale-dependent cascade process through a hierarchy of spatial and temporal scales is an integral part of turbulence theory, this stochastic treatment of the cascade process has the potential for a new way to link to fluctuation theorems of non-equilibrium stochastic thermodynamics. In particular, entropy production can be determined for local turbulent flow structures, based on this the validity of the integral fluctuation theorem can be verified.

The development of this package greatly enhances the practicability and availability of this method, which allows a comprehensive statistical description in terms of the complexity of turbulent velocity time series. It can also be used by researchers outside of the field of turbulence for the analysis of data with turbulent like complexity. Support is available:

https://github.com/andre-fuchs-uni-oldenburg/OPEN_FPE_IFT

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Date submitted: 07 Aug 2020   Electronic form version 1.4