

PiAI Seminar Series: Physics informed AI in Plasma Science
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Web Seminar

Functional relation and structure of distribution function in plasma
turbulent transport

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In magnetic fusion researches, numerical simulation based on gyrokinetics is the most reliable way for studying turbulent transport physics, and rapid developments in high-performance computing have advanced our understanding the transport physics. For example, it has been clarified that zonal flows (ZFs), which are generated through the nonlinear processes with turbulences [1], determine the transport levels regulating the turbulences by the ZFs. In our works, it has been found that the transport coefficient can be represented by a certain function of amplitudes of the turbulence and the ZFs, phenomenologically [2]. Recently, the extension and application of the function to reproduce the transport levels precisely are studied [3,4], and the manifold structure formed in the hyper-dimensional model parameter space of the function is discussed [5]. Furthermore, to clarify the zonal flow effects on the transport, the visualization and clustering of the distribution function of the turbulent plasma in phase space [6].

- [1] P. Diamond, *et al.*, Plasma Phys. Control. Fusion **47**, R35 (2005).
- [2] M. Nunami, *et al.*, Phys. Plasmas **20**, 092307 (2013).
- [3] T. Nakayama, *et al.*, Plasma Phys. Control. Fusion **64**, 075007 (2022).
- [4] K. Fujii, *et al.*, Plasma Fusion Res. **17**, 2403030 (2022).
- [5] M. Nunami, *et al.*, 27th ICNSP (2022).
- [6] T. Sadakata, *et al.*, Plasma Fusion Res. **17**, 2403079 (2022).