Contribution ID: **2949** Type: **not specified**

# I4.J602 Time intermittency in non-diffusive fast ion transport in turbulent toroidal plasmas

*Thursday, 11 July 2019 12:10 (30 minutes)*

See the full abstract here http://ocs.ciemat.es/EPS2019ABS/pdf/I4.J602.pdf

Fast ions denote a part of the ion population of a plasma that exhibits speeds far above the thermal average. They appear in astrophysical plasmas, e.g. as Solar Energetic Particles (SEPs)[1]. In fusion plasmas, fast ions originate from fusion reactions or neutral beam injection and their confinement is crucial to the performance of any reactor [2]. Understanding their interaction with turbulence and transport properties is of high relevance across all these domains.
Fast ion turbulent transport is therefore a key research objective on the TORoidal Plasma EXperiment at the Swiss Plasma Center [3]. With a low-temperature (ca. 1 eV) in helical open magnetic field-lines, TORPEX plasmas feature a dominant interchange mode giving rise to electrostatic plasma turbulence and the intermittent propagation of coherent filament structures, termed 'blobs' [3] . The cross-field spreading of a toroidally injected Li-6 fast ion beam has been identified as generally non-diffusive through comparisons with predictions from the Global Braginskii Solver (GBS) code [4]. Fast ions of higher energies (70 eV) exhibit sub-diffusion, while lower energies (30 eV) result in superdiffusion, which transitions to quasi-diffusion at longer propagation times [3, 4]. During initial studies, superdiffusive transport appeared time intermittent, as local fast ion time-series showed significant skewness [5], but did not in subdiffusion.
We report the findings of an extensive 3D set of fast ion time-series, demonstrating the prevalence of time intermittency across all observed non-diffusive transport regimes [6]. We introduce an analytical model [7] for the prediction of skewness of the time-series based on the motion of a concentrated instantaneous fast ion beam within its time-average. While possibly of direct interest in similar systems, these efforts illustrate the general importance of concrete physical models when relating time intermittency and non-diffusive transport.

References
[1] G. Zimbardo et al. , J. Plasma Phys. 81, 06 (2015).
[2] M. Albergante et al. , Plasma Phys. Contr. F. 53, 05 (2011).
[3] I. Furno et al. , J Plasma Phys, 81, 03 (2015).
[4] A. Bovet et al. , Phys. Rev. E 91, 041101(R) (2015).
[5] A. Bovet et al. , Phys. Rev. Lett. 113, 225001 (2014).
[6] F. Manke et al. , (submitted to Phys. Rev. E).
[7] M. Baquero-Ruiz et al. , Phys. Rev. E 98, 032111 (2018).

## pppo

**Presenter:** MANKE, F. (EPS 2019)

**Session Classification:** BSAP-MCF

**Track Classification:** Joint Sessions