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JT-60Uにおける突発的揺動と雪崩的熱輸送の観測
Observation of bursty fluctuation associating to avalanche heat transport in JT-60U

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The non-local phenomena observed in the transient transport experiments have been casting questions on modelling turbulent transport as local diffusive nature, i.e., expressing fluxes by the Fick's law [1]. Although some experiments clearly showing the breakdown of the Fick's law, the fusion community still discussing whether to deal with turbulent transport by local or non-local models. This is because the lack of experimental observations, that is, how amount of non-local transport components really dominating in the self-sustained plasmas (without any external perturbations). The concept of avalanching, which is sequentially occurring transport events like domino-process, are one of the non-local transport models [2]. As seen from flux-driven simulations, there are lots of results that the avalanches dominate the transport especially in near marginal states, e.g., the stiffness profile [3]. On the other hand, the experimental observations of avalanches are quite few [4-6], and the level of avalanche driven transport is never been observed. Only simple estimates of avalanche inducing electron heat flux are discussed in [7].

In this study, we have observed the avalanche driven electron heat flux quantitatively, thus it makes us possible to validates the effects of avalanches on profile formations like stiffness. Since bursty increasing fluctuations, which is observed by reflectometer, are synchronized to avalanche events, we can possible to reduce the noise level of ECE signals by applying conditional averaging. We found that the amount of avalanche driven electron heat flux is not negligible, and it is substantial and essential for sustaining the stiffness profiles and limiting the ITB formations [8].

In the talk, we will show the characteristics of bursty increasing fluctuations and associating avalanches observed in JT-60U, and we will explain the estimation process of avalanche driven electron heat flux. The increases of avalanche driven electron heat transport with respect to NB-heating power are shown to discuss the stiff profile formations.

Reference

[1] K. Ida, et al. Nucl. Fusion 55, 013022 (2015).
[2] P. H. Diamond and T. S. Hahm, Phys. Plasmas 2, 3640 (1995).
[3] Y. Idomura et al. Nucl. Fusion 49 (2009).
[4] P. A. Politzer. Phys. Rev. Lett. 84, 1192 (2000).
[5] M. J. Choi et al. Nucl. Fusion 59 (2019).
[6] W. Chen et al. Nucl. Fusion 60 (2020).
[7] P. A. Politzer et al. Phys. Plasmas 9, 1962 (2002).
[8] F. Kin et al., will be submit to Nat. phys.