Intermittent Fluctuation Property of JT-60U Edge Plasmas

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Recently, intermittent convective plasma transport, so-called "blobs" has been observed in the edge plasmas of several fusion devices, which is thought to play a key role for cross-field plasma transport. In this presentation, we will report the statistical analysis of the intermittent edge plasma fluctuation of ion saturation currents I_{sat} and/or floating potential measured with probes in JT-60U tokamak device.

The fluctuation property has been analyzed with probability distribution function (p.d.f.) to obtain a basic property of the intermittent plasma transport. When large positive fluctuations are much greater than expected values from a random distribution (Gaussian distribution), the p.d.f. is positively skewed. The deviation from the Gaussian distribution function can be characterized by skewness. In the JT-60U, the reciprocating Mach probes are installed at the low field side (LFS) mid-plane and just below the X-point. We have mainly analyzed the time evolution of I_{sat} with the Mach probe installed in the mid-plane at the low-field side and divertor probe array. The sampling time of I_{sat} is 2 and/or 5μs. Cross- and parallel- transports of the intermittent density bursts including ELM events[1] are also discussed by comparing the spatiotemporal behaviour of the fluctuations in I_{sat}.

At the LFS mid-plane, the skewness of I_{sat} increases with the distance from separatrix d_{sep}. It peaks around d_{sep}=60-80mm, where direction of the parallel SOL flow changes downward to upward, in both L-mode and ELMy H-mode discharge. It indicates that there is strong relation between the process of cross-field transport like blobs and parallel SOL flow. From analysis SOL profiles of I_{sat} in ELMy H-mode discharge, decay length of I_{sat} during ELM is about three times as long as one of I_{sat} between ELMs. Thus the plasma during ELM convectively transports in the radial direction much easier in comparison with the one between ELMs, which corresponds to bulk plasma.

[1] N. Asakura, M. Takechi, N. Oyama, T. Nakano, J. of Nucl. Mater. 337-339 (2005) 712-716.