The Role of Power and Magnetic Connection to the Active Antenna in the suppression of Intermittent Structures by Ion Cyclotron Resonance Heating

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Intermittency in the scrape-off layer (SOL) of magnetic fusion devices was shown to be caused by the so-called avaloids (or blobs) that are large-scale structures with large radial velocity [1]. These structures were shown to account for at least 50\% of the total radial transport outside the confined region and are thus of prime importance not only to study and understand their origins but also to find ways to suppress them. Recently, we have shown that when using the ion cyclotron resonance heating (ICRH), these structures were suppressed almost completely reducing the level of radial transport by about 50\%. The study was done on H-mode plasmas at the ASDEX-Upgrade tokamak [2]. Furthermore, it was observed that the ELM-induced transport is greatly affected with a decrease by a factor of 3. We report results on the Tore Supra tokamak where turbulence in the SOL is investigated in the presence of ICRH. Intermittent radial transport by avaloids is observed to be suppressed by ICRH in excellent agreement with the ASDEX-Upgrade results. Consequently, the statistical properties of turbulence are greatly modified. The probability distribution function of the density fluctuations is observed to be Gaussian and the power spectrum shows the strong decrease at the low-frequency range. The connection of the magnetic field lines to the antenna was found not to be crucial. Turbulent fluctuations with field lines connected to the area close to the ICRH antenna were observed to be modified whereas far no effect was detected.

Figure(1): (a) the plasma discharge main parameters. (b), the relative level of turbulence in the SOL measured by a fixed probe decreases sharply after the ICRH; the turbulence level goes back up after switching off the ICRH.