Intermittent Convective Transport In DIII–D Edge Plasmas*

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Plasma density, temperature and potential and the inferred $E\times B_T$ radial transport measured with probes in the scrape off layer (SOL) of H– and L–mode plasmas in the DIII–D tokamak display intermittent bursts corresponding to structures featuring higher pressure than the surrounding plasma and responsible for 50% of the $E\times B_T$ radial transport. The particle content of the bursts is considerably lower in H–mode discharges. The intermittent transport is convective in nature and produces a significant outward particle flux even in the absence of a radial density gradient. UEDGE 2-D fluid modeling using five independent transport coefficients will be compared to the measured profiles and probe measured particle fluxes. The bursts appear at a rate of $\sim 10^4\ s^{-1}$ and conditional averaging reveals they are positively charged and polarized. The polarization results in poloidal fields of up to 4000 V/m which propel the structures radially with $E\times B_T/B^2$ velocities of ~2600 m/s near the last closed flux surface (LCFS) and ~330 m/s near the wall. The bursts move poloidally at speeds of up to 4500 m/s at the LCFS, slowing down towards the wall as they shrink in radial size from 4 cm to 0.5 cm. The bursts possess vorticity, as inferred from their internal electric field, which is gradually lost as they leave the LCFS. The ∇B drift is a strong candidate for the structures' polarization since the sign of their internal poloidal electric field reverses upon reversal of B_T. The measured cross-field turbulent transport and intermittent bursts affect the plasma refueling and impurity generation from the wall. Thus their understanding is fundamental to understanding of the interaction of a plasma core with its walls.

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