Recent progress towards a quantitative description of filamentary SOL transport

A summary of recent results on filamentary transport, mostly obtained with the ASDEX-Upgrade tokamak (AUG), is presented and discussed in an attempt to produce a coherent picture of scrape-off layer (SOL) filamentary transport. A clear correlation is found between L-mode density shoulder formation in the outer midplane and a transition between the sheath-limited and the inertial filamentary regimes. Divertor collisionality is found to be the parameter triggering the transition. A clear reduction of the ion temperature takes place in the far SOL after the transition, both for the background and the filaments. This coincides with a strong variation of the ion temperature distribution, which deviates from Gaussianity and becomes dominated by a strong peak below 5 eV. The filament transition mechanism triggered by a critical value of collisionality seems to be generally applicable to inter-ELM H-mode plasmas, although a secondary threshold related to deuterium fueling is observed. EMC3-EIRENE simulations of neutral dynamics show that an ionization front near the main chamber wall is formed after the shoulder formation. Finally, a clear increase of SOL opacity to neutrals is observed, associated with the shoulder formation. A common SOL transport framework is proposed to account for all these results, and their potential implications for future generation devices are discussed.