

## Recent progress in SOL turbulence simulations

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There has been a great deal of recent work on two-dimensional (radial-poloidal) simulations of SOL turbulence with the goal of understanding the cross-field turbulent transport. One of the important questions in interpreting the simulation results is whether they can be related to the various analytic scalings that comprise the blob model.<sup>1-5</sup> However, 2D simulations of SOL turbulence are not sufficient in situations where the linear mode structure (and the nonlinear blobs) have strong variation (“ballooning”) along the field line, e.g. in the presence of X-points and/or at high collisionality.<sup>6-9</sup> On the other hand, 3D simulations are expensive and not always practical for extensive parameter studies. Recently, we have developed a compromise approach,<sup>5</sup> referred to here as the “two region model” (TRM), in which the full 2D structure is calculated on two coupled planes representing the outer midplane and the divertor region, respectively. The model includes parallel transport of charge, particles and heat between regions, and treats the parallel variation in the eigenfunction in a two-point approximation. Previously we have described TRM simulations of initialized blobs and used the code to verify the “blob correspondence principle.”<sup>5</sup> Some preliminary turbulence simulations were also reported at recent meetings. Here, we discuss the application of TRM code to study interesting questions in SOL turbulence:<sup>10</sup> (i) the physics of disconnection and its effect on turbulent transport; (ii) dependence of the turbulent flux (or blob creation) on collisionality and magnetic geometry; and (iii) the use of turbulence statistics (e.g. skewness) to infer the blob birth zone and the “blob packing fraction”. The trends shown in these simulations shed light on recent experimental data and 3D simulations of the resistive-X point and resistive ballooning parameter regimes.

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