

How Coherent Structure Accelerates Turbulence Spreading: a 'Trapping-hopping' Mechanism

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We report a novel mechanism of turbulence spreading into the magnetic island. It is found that the coherent convective cells (named as quasi-coherent mode in experiment) on both sides of the O-point boundary are accumulated during the island formation. The phase entrainment of the convective cells on the turbulence both in the inner and the outer regions of the magnetic island sets up a new transport channel, and leads to a fast spreading of the outer turbulence into the magnetic island by conquering the flow shear at the O-point boundary. This trapping-hopping mechanism of turbulence spreading is analogous to a turbulence version

of the well-known enhanced diffusion of passive scalars in laminar convective flows of neutral fluid system.

References

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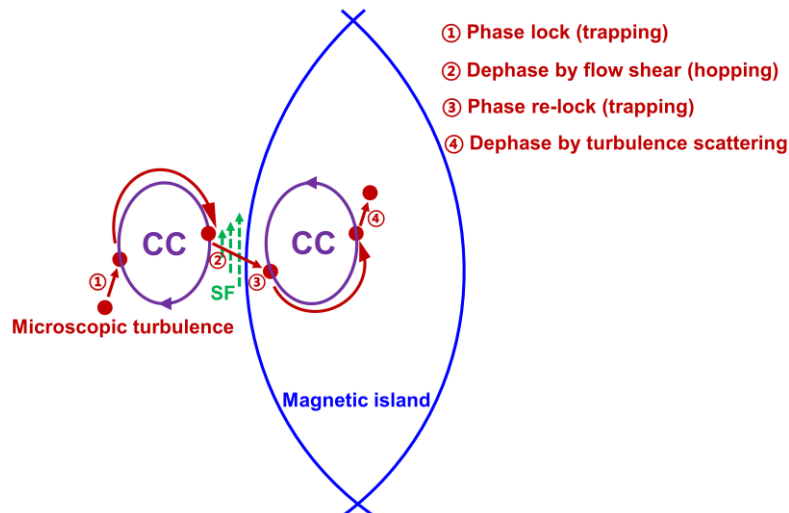


Figure 1. A schematic illustration of the trapping-hopping mechanism. Here blue line represents magnetic island boundary, purple circles represent coupled CCs, green arrows represent shear flows (SF), red dots and arrows represent microscopic turbulence and routes of spreading from outside into the magnetic island, respectively.