Contribution ID: **11** Type: **Poster**

TH/P4-01: Impact of Resonant Magnetic Perturbations on Zonal Modes, Drift-Wave Turbulence and the L-H Transition Threshold

Wednesday, October 10, 2012 2:00 PM (4h 45m)

We study the effects of Resonant Magnetic Perturbations (RMPs) on turbulence, flows and confinement in the framework of resistive drift-wave turbulence. This work was motivated by experiments reported at IAEA 2010 conference [1] that showed a decrease of long-range correlations during the application of RMPs. To elucidate the effect of the RMPs on zonal structures in drift-wave turbulence, we construct an extended Hasegawa-Wakatani model including RMP fields [2,3]. The effect of the RMPs is to induce a linear coupling between the zonal electric field and the zonal density gradient –i.e. a spatial modulation of the electron diamagnetic frequency –which drives the system to a state of electron radial force balance for large RMP amplitude. A predator-prey model coupling the primary drift-wave dynamics to the zonal mode dynamics is derived. This model has both turbulence drive and RMP amplitude as control parameters and predicts a novel type of transport bifurcation in the presence of RMPs. The novel regime has a power threshold which increases as the square of RMP amplitude. This is in qualitative agreement with experiments [4,5]. Recent results includes a description of the full L-H transition scenario with RMPs, including the mean flow, the modeling of field line stochastization by a hyper-resistivity linking zonal perturbations of potential and density in Ohm law, and the extension of the RMP-modified Hasegawa-Wakatani model to include the dynamics of parallel flow and ion temperature, to describe RMP effects on ITG turbulence.
[1] Y. Xu et al. , Nucl. Fusion 51 063020 (2011).
[2] M. Leconte and P.H. Diamond, Phys. Plasmas 18 082309 (2011).
[3] M. Leconte and P.H. Diamond, 53rd APS DPP international conference, Salt Lake City, UT, USA, invited session CI2 http://pop.aip.org/53rd_meeting, accepted in Phys. Plasmas.
[4] A. Kirk et al. , Plasma Phys. Control. Fusion 53 065011 (2011).
[5] F. Ryter et al. , Proceedings of the 13th International Workshop on H-Mode Physics, Oxford, UK (2011), accepted in Nucl. Fusion.

Country or International Organization of Primary Author

KOREA, Republic of

Primary author: Mr LECONTE, Michael (NFRI)

Co-authors: Prof. DIAMOND, P. H. (NFRI/UCSD); Dr XU, Y. (Association Euratom-Belgian State)

Presenter: Mr LECONTE, Michael (NFRI)

Session Classification: Poster: P4

Track Classification: THC - Magnetic Confinement Theory and Modelling: Confinement