

# International Plasma Science Seminar

日時： 平成 24 年 4 月 19 日 (木)

場所： 九州大学応用力学研究所 2F大会議室

## ◆◆◆ Program ◆◆◆

**15:00 – 16:00 Maxime Lesur**

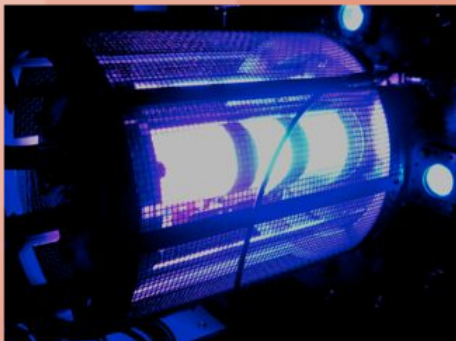
National Fusion Research Institute,  
WCI Center for Fusion Theory, KOREA

### Title

Phase-space turbulence, and nonlinear instabilities  
driven by self-organized structures

### Abstract

Coherent phase-space structures are an important feature of plasma turbulence. They can drive nonlinear instabilities, intermittency in drift-wave turbulence, interact with zonal-flow, and cause transport that departs from quasilinear predictions. Thus it is crucial to revive efforts toward a comprehensive understanding of turbulence, not merely as an ensemble of waves, but as a mixture of coupled waves and localized structures. My strategy is to develop the theory step-by-step, starting from the simplest model. The Berk-Breizman (BB) model is a tractable paradigm for wave-particles interactions, in the presence of extrinsic dissipation. Despite its apparent simplicity, this model exhibits a wealth of complex nonlinear behavior, including spontaneous creation and evolution of phase-space structures. In this seminar, I will review nonlinear wave-particle interactions, the BB model and its experimental applications to laboratory and space plasmas, notably energetic particle-driven Alfvén wave experiments. Then I will focus on two novel points. The first point is a new theory which describes the growth of coherent phase-space structures called as holes and clumps, which can in turn drive the wave by direct momentum exchange due to the dissipation. This mechanism explains the existence of nonlinear instabilities in both barely unstable and linearly stable (subcritical) regimes. The second point is numerical evidence of the breakdown of quasi-linear theory in the presence of structures. Extending the BB model to multiple resonances, simulations show that coalescing holes survive much longer than the classical quasilinear diffusion time and dominate the nonlinear evolution.



<主催> 伊藤極限プラズマ研究連携センター <参加> 事前申し込み不要

<お問合せ先> 九州大学応用力学研究所 稲垣 滋 TEL: 092-583-7722 E-mail: [inagaki@riam.kyushu-u.ac.jp](mailto:inagaki@riam.kyushu-u.ac.jp)