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**TH/P1-10** · General Fluid Theories, Variational Principles and Self-Organization

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**Abstract:** This paper reports two distinct but related advances: (1) The development and application of fluid theories that transcend conventional magnetohydrodynamics (MHD), in particular, theories that are valid in the long-mean-free-path limit and in which pressure anisotropy, heat flow, and arbitrarily strong sheared flows are treated consistently. (2) The discovery of new pressure-confining plasma configurations that are self-organized relaxed states.

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**TH/P1-11** · Creation and Dynamical Co-evolution of Electron and Ion Channel Transport Barriers

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**Abstract:** A wide variety of magnetic confinement devices have found transitions to an enhanced confinement regime. Simple dynamical models have been able to capture much of the dynamics of these barriers however an open question has been the disconnected nature of the electron thermal transport channel sometimes observed in the presence of a standard ("ion channel" barrier. By adding to simple barrier model an evolution equation for electron fluctuations we can investigate the interaction between the formation of the standard ion channel barrier and the somewhat less common electron channel barrier. Barrier formation in the electron channel is even more sensitive to the alignment of the various gradients making up the sheared radial electric field then the ion barrier is. Electron channel heat transport is found to significantly increase after the formation of the ion channel barrier but before the electron channel barrier is formed. This increased transport is important in the barrier evolution.

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**TH/P1-12** · Characterisation of Temperature Gradient Driven Turbulence and Transport

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**Abstract:** We report on extensive numerical studies aimed at characterising various aspects of temperature gradient driven turbulence. We specifically discuss results from 3D fluid models of ETG and of ITG turbulence, and results from a 2D+2D gyrokinetic model of trapped ion turbulence. Global transport exhibits gyro-Bohm scaling in both the ETG and the ITG model. The conductivity of the ETG model decreases weakly with beta. The heat transport is due to the EXB advection, the effect of the magnetic flutter is negligible. However the transport level is much lower than experimentally observed. In both 3D models the correlation lengths scale with the gyroradius, but they are typically a factor 10 larger. Vortices are elongated but their aspect ratio is independent of the gyroradius. Their radial size is limited by LD. The trapped ion model gives larger vortices due to the absence of LD from passing ions. Avalanches are observed in all the models, the weakest occurring in the ITG system. Their range increases with gyroradius, but more weakly than linearly. Finally, ZFs can limit the range of the avalanches, which explains why avalanches are weaker in the ITG model which is more sensitive to ZFs.