# On mesoscale plasma pressure perturbations in tokamak

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Strongly localized mesoscale plasma structures with large pressure inhomogeneities (such as plasma blobs in the scrape-off-layer (SOL)/shadow regions, pellet clouds, ELMs) observed in the tokamaks, stellarators and linear plasma devices. Experimental studies of these phenomena reveal striking similarities including more convective rather than diffusive radial plasma transport [1]. We suggest that rather simple models can describe many essentials of nonlinear evolution of plasma pressure perturbation like blobs, ELMs, and pellet clouds dynamics [2]. The main ingredient of these models is the effective plasma gravity caused by magnetic curvature, centrifugal or friction forces effects [3]. As a result, the equations governing plasma transport in such localized structures appear to be rather similar to that used to describe nonlinear evolution of thermal convection in the Boussinesq approximation (directly related to the Rayleigh-Taylor instability). However, "dissipative" terms in the equations describing blobs, pellet clouds, ELMs, and thermal convection are different. In case where dissipation is not important we find that mushroom shape of originally circular blob develops similar to the typical mushrooms shapes in the dynamics of the Rayleigh-Taylor instability. Otherwise, "dissipative" terms can bring structural stability of mesoscale plasma pressure perturbations and they propagate on large distances as coherent structures. We also discuss the phenomenology of 2D Rayleigh-Taylor turbulence (see Ref. 4 and the references therein) and plasma turbulence properties, which follows from our models. These results can be compared with experimental data on ELM statistical properties in the scrape-off layer.

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