Abstract Submitted
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A paradigm for the stability of the plasma sheath ENRICO CAMPOREALE, GIAN LUCA DELZANNO, LANL — we present an investigation of the linear stability of the sheath of a (non-electron emitting) wall at floating potential in the framework of a fluid plasma model where the continuity and momentum equations of the electrons and ions are coupled through Poisson's equation. Initially, we neglect the presence of a magnetic field and the wall is negatively charged. In the limit where the equilibrium ion flow is artificially suppressed, we show that the system can be unstable to the Rayleigh-Taylor (RT) instability, driven by the favourable combination of the ion density gradient and electric field in the sheath equilibrium. However, the sonic ion flow strongly stabilizes the RT modes due to convective stabilization, ultimately leading to a stable sheath. Thus, we cast the paradigm of sheath stability as a balance between two competing effects: the RT instability and the flow stabilization. While the sheath of a negatively charged wall at floating potential is stable, we discuss how this balance can be altered (for instance by negatively biasing the wall) so that the sheath can become unstable. We will also present our latest results on the effect of an equilibrium magnetic field, obtained by PIC simulations, on the sheath stability.

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