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Transient Growth in a Magnetized Vlasov Plasma[1] VALERIA RATUSHNAYA, RAVI SAMTANEY, King Abdullah University of Science and Technology — Collisionless plasmas, such as those encountered in tokamaks, exhibit a rich variety of instabilities. The physical origin, triggering mechanisms and fundamental understanding of many tokamak instabilities, however, is still an open problem. Aiming to gain a better insight into this question, we investigate the stability properties of a collisionless Vlasov plasma for the case of: (a) stationary homogeneous magnetic field, and (b) weakly non-stationary and non-homogeneous magnetic field. We narrow the scope of our investigation to the case of a Maxwellian plasma and examine its evolution with an electrostatic approximation. We show that the linearized Vlasov operator is non-normal, which leads to an algebraic growth of perturbations in a magnetized plasma followed by exponential decay, i.e., classical Landau damping behaviour. This is a so-called transient growth phenomenon, developed in the framework of non-modal stability theory in the context of hydrodynamics. In a homogeneous magnetic field the typical time scales of the transient growth are of the order of several plasma periods. The first-order distribution function and the corresponding electric field are calculated and the dependence on the initial conditions is studied.

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