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Some Landau damping results for the HMF model and its discrete time approximation

We consider solutions of the Vlasov-HMF model starting in a small Sobolev neighborhood of a spatially homogeneous stationary state satisfying a linear stability criterion and prove a scattering result (Landau damping). We then consider time discretizations of these solutions based on splitting methods between the linear and non-linear part of the equation and we prove that the numerical solutions converge weakly to a modified state which is close to the continuous one. We also prove that our numerical scheme is uniformly convergent, with a convergence rate of order one for Lie splittings, and two for Strang splittings. We will also consider the case of non-homogeneous states for which action-angle variables can be used.