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Finite component reductions of collisionless kinetic equations

We consider two approaches for extraction of finite component systems from collisionless kinetic equations. The first method is based on the theory of generalized functions, which in simplest case is nothing but the so called multi flow hydrodynamics well known in plasma physics. An alternative is the so called moment decomposition method successfully utilized for hydrodynamic chains. We prove that both approaches lead to the same finite component systems.

The method of hydrodynamic reductions successfully utilized in the theory of integrable hydrodynamic chains is applied to the local and nonlocal kinetic equations. N component reductions parameterized by $(N - 1)$ arbitrary constants for non-hydrodynamic chain arising in the theory of high frequency nonlinear waves in electron plasma are found. These evolution dispersive systems equipped with a local Hamiltonian structure possess periodic solutions.