A particle-based micro-macro decomposition for Boltzmann-BGK-like equations in the diffusion scaling

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In this talk, I will present a new asymptotic preserving scheme for kinetic equations of Boltzmann-BGK type in the diffusion scaling. The scheme is based on micro-macro decomposition, the micro part being discretized by a particle method. Thanks to the particle approximation, the computational cost of the method is reduced when the system approaches the diffusive limit. However, this approximation requires a splitting between the transport part and the collisional one, so that both stiff terms can not offset each other a priori, which prevents from uniform stability. That is why we propose a suitable reformulation of the micro-macro system, without stiff terms. The scheme will be presented in detail and illustrated by several numerical results. This work, in collaboration with Nicolas Crouseilles and Mohammed Lemou, has been extended to second-order in time and to equations of Vlasov-BGK-Poisson type.