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The Boltzmann equation, Besov spaces, and optimal time decay rates in the whole space

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(Submitted on 31 May 2012)

We prove that \$k\$-th order derivatives of perturbative classical solutions to the hard and soft potential Boltzmann equation (without the angular cut-off assumption) in the whole space, $\t treed_x$ with \DgE , converge in large-time to the global Maxwellian with the optimal decay rate of $O(t^{-1/2}(k+\ALTsig+\frac{\Ndim}{2}-\frac{\Ndim}{r}))$ in the $L^r_x(L^2_{\vel})$ -norm for any $2\eq r\eq infty$. These results hold for any $ALTsig \n [0, \Mdim/2]$ as long as initially $\int 0_{\Vdt}B^{-}(ALTsig,\infty)_2 L^2_{\vel}) < \fractor for the hard potential case, we prove faster decay results in the sense that if <math>|\PP f_0|_{\Vdt}B^{-}(ALTsig,\infty)_2 L^2_{\vel}) < \fractor for $ALTsig \n (\Ndim/2, (\Ndim+2)/2]$ then the solution decays to zero in $L^2_\vel(L^2_x)$ with the optimal large time decay rate of $O(t^{-1/2}(ALTsig))$.$

Comments:58 pagesSubjects:Analysis of PDEs (math.AP); Mathematical Physics (math-ph)Cite as:arXiv:1206.0027v1 [math.AP]

Submission history

From: Robert Strain [view email] [v1] Thu, 31 May 2012 20:36:38 GMT (59kb)

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