Kinetic limit of dynamical description of wave-particle self-consistent interaction in an open domain

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Interactions

- Two kinds of interactions:
  - wave-particle;
  - particle-particle.
- Interactions are limited to a region defined by R.

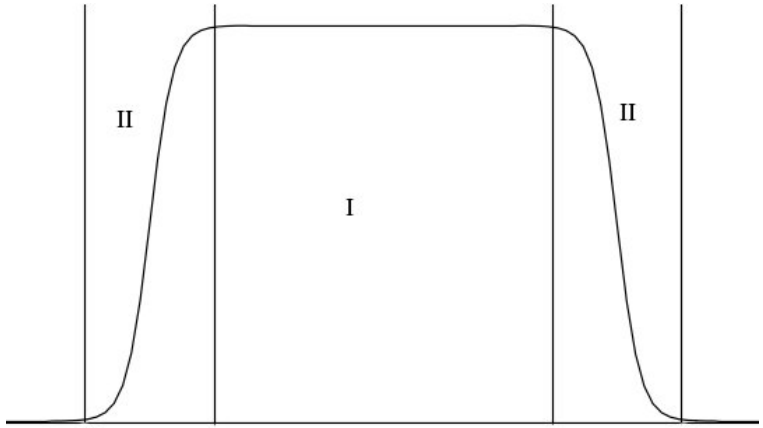

Figure: I: core region; II: border; I + II: interaction region

$$H(x,p,X,Y) = \sum_r \frac{p_r^2}{2} + \sum_j H_{0j}(X_j,Y_j) + \varepsilon' \sum_{r,r'} U(x_r,x_r')R(x_r)R(x_r')$$
$$+\varepsilon \sum_{r,j} k_j^{-1}\beta_j(Y_j \sin k_j x_r - X_j \cos k_j x_r)R(x_r)$$

Main result

- Distance between solutions is limited by

$$\|(\mu_t, a(t)) - (\mu'_t, a'(t))\| \leq e^{\xi t}\|(\mu_0, a(0)) - (\mu'_0, a'(0))\|$$

- Thus,

$$\begin{array}{ccc} (\sigma^R_{0N}, a_N(0)) & \xrightarrow{\text{Dyn. eqs}} & (\sigma^R_{tN}, a_N(t)) \\ \Big\downarrow{\scriptstyle N\to\infty} & & \Big\downarrow{\scriptstyle N\to\infty} \\ (f(x,v,0)\mathrm{d}x\mathrm{d}v, a(0)) = (\sigma_0, a(0)) & \xrightarrow{\text{Kin. Eq.}} & (\sigma_t, a(t)) = (f(x,v,t)\mathrm{d}x\mathrm{d}v, a(t)) \end{array}$$

Merci de votre attention!