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Latent heat and heat conduction

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It is from a joint work with Matteo Colangeli and Anna De Masi.

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At phase separation there are density gradients without current.

The current has the **wrong** sign when the reservoir densities are metastable, numerical and some theoretical evidence.

Construction of metastable states with a non-zero current and no external forces.

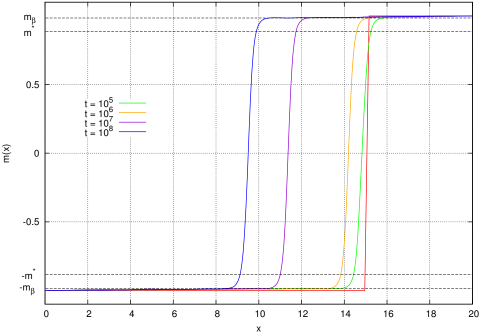

Figure: Magnetization profiles for $C = 1.25$ and $m_+ = 1$ with space in γ^{-1} $(= 30)$ units. The parameters m_β and m^* have values $m_\beta = 0.985$ and $m^* = 0.885$. The different curves in the plot correspond to the averaged magnetization computed at different times: $t = 10^5$ (green curve), $t = 10^6$ (orange curve), $t = 10^7$ (purple curve) and $t = 10^8$ (blue curve). The red curve denotes the initial configuration.

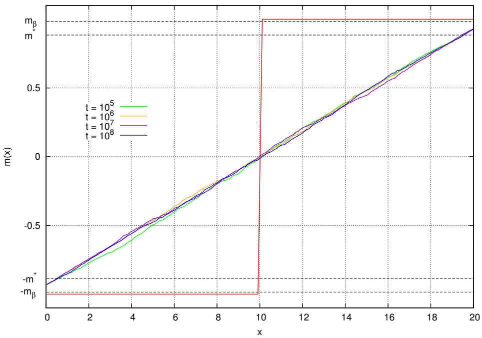

Figure: Magnetization profiles for $C = 0$, $m_\beta = 0.985$ and $m^* = 0.885$, and with $m_+ = 0.93$. The curves in the plot have the same meaning of those illustrated in Fig. 1. The standard Fourier law is satisfied.

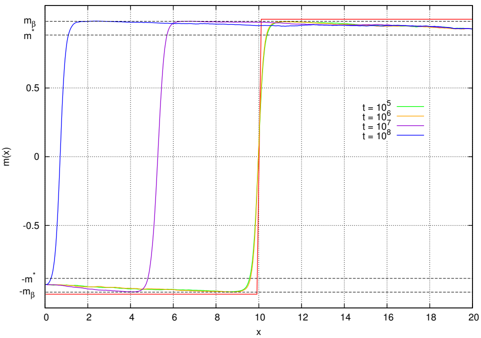

Figure: Magnetization profiles for $C = 1.25$, $m_\beta = 0.985$ and $m^* = 0.885$, and with $m_+ = 0.93$. The curves in the plot have the same meaning of those illustrated in Fig. 1.

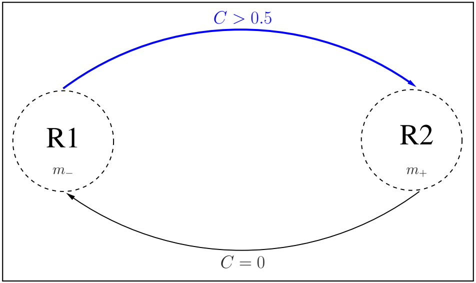

Figure: Schematization of the system made of two reservoirs $R1$ and $R2$, endowed with magnetization m_- and, respectively, m_+ and connected by two channels. The channel on the top (blue arrow) is characterized by $C > 0.5$, hence the current flows from the smaller density corresponding to m_- to the larger one corresponding to m_+, cf. Fig. 3. The channel on the bottom (black arrow) has $C = 0$ and the corresponding current flows in the opposite direction, cf. Fig. 2.

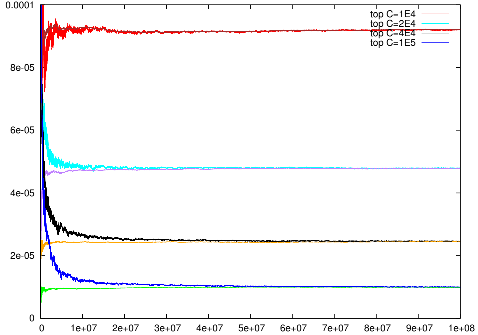

Figure: Values of the current for different values of the exchange rate between finite reservoirs

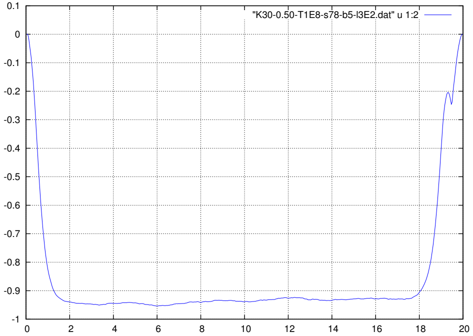

Figure: Magnetization profile when the infinite reservoirs impose magnetization 0