Energy Flow in Periodically Forced Atom Chains

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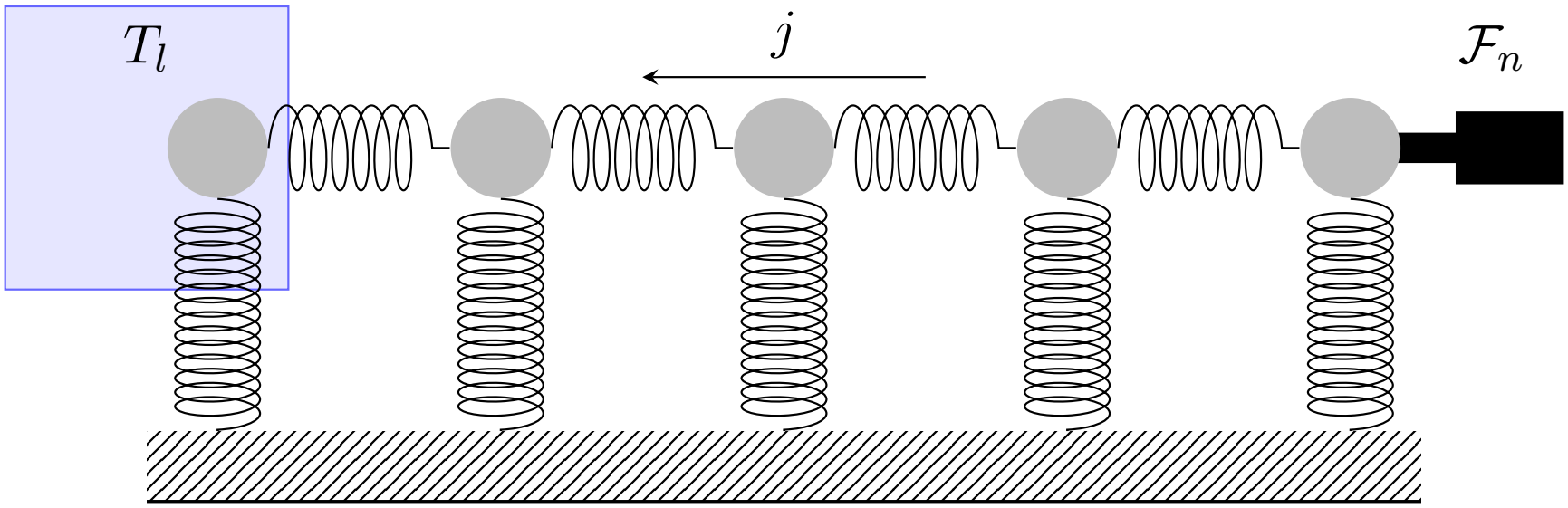
Model: FPUT Chain Undergoing Cosine Forcing



$$\dot{q}_x = p_x \quad x = 0, 1, \ldots, n$$

$$dp_0 = \left((q_1 - q_0) - \left(q_0 + q_0^3\right)\right) dt - \gamma_l p_0 dt + \sqrt{2\gamma_l T_l} dW_0(t)$$

$$dp_x = \left((q_{x+1} + q_{x-1} - 2q_x) - \left(q_x^3 + q_x\right)\right) dt - 2p_x(t-) dN_x\left(\widetilde{\gamma} t\right)$$

$$dp_n = \left((q_{n-1} - q_n) - \left(q_n^3 + q_n\right)\right) dt - 2p_n(t-) dN_n\left(\widetilde{\gamma} t\right) + \frac{f_0}{\sqrt{n}} \cos\left(\omega t\right) dt$$

$$\mathcal{H}\left(q, p\right) = \sum_{i=0}^{n} \left[\frac{\left(q_i - q_{i-1}\right)^2}{2} + \left(\frac{q_i^2}{2} + \frac{q_i^4}{4} \right) \right] \qquad j_{x,x+1} = -p_x \left(q_{x+1} - q_x\right)$$

Some Simulation Results (without flip $\widetilde{\gamma} = 0$)

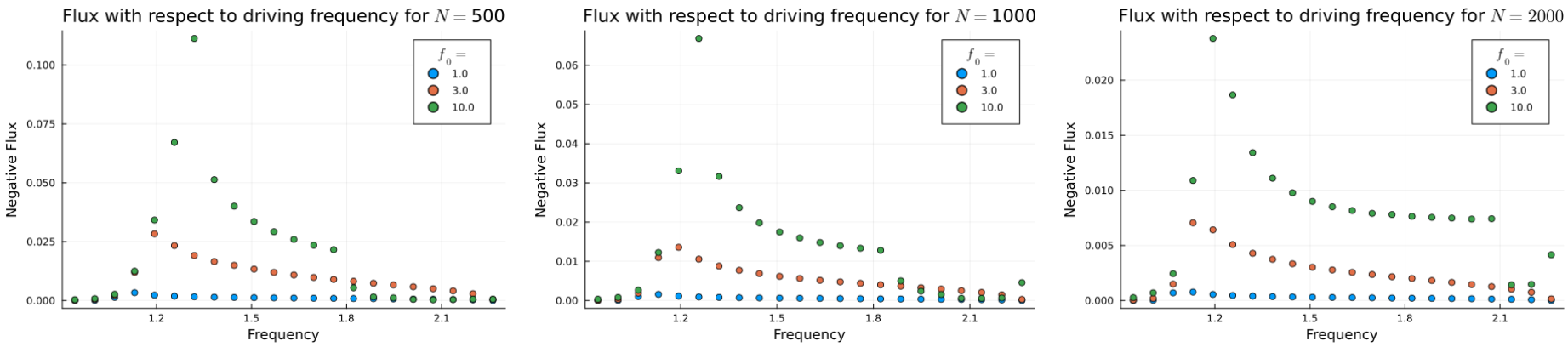


Figure: Numerically observed steady-state energy flux for various system sizes

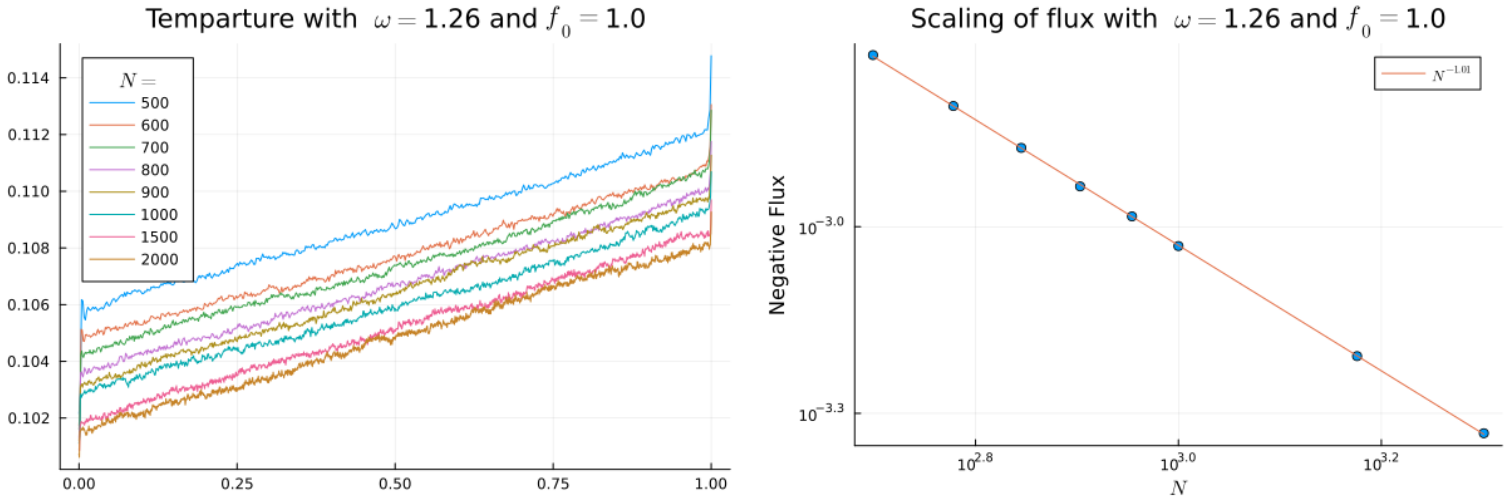


Figure: Numerically observed temperature profiles for several system sizes and scaling of flux with respect to to system size

Adding Random Momentum Flip $\widetilde{\gamma} = 1$

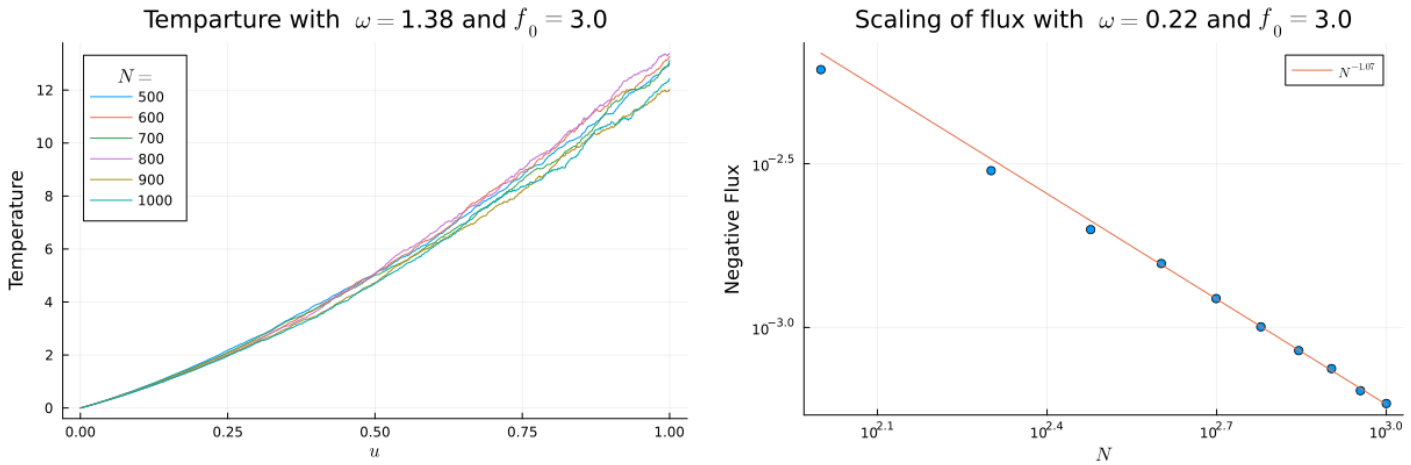


Figure: Numerically observed temperature profiles for various system sizes and scaling of energy flux

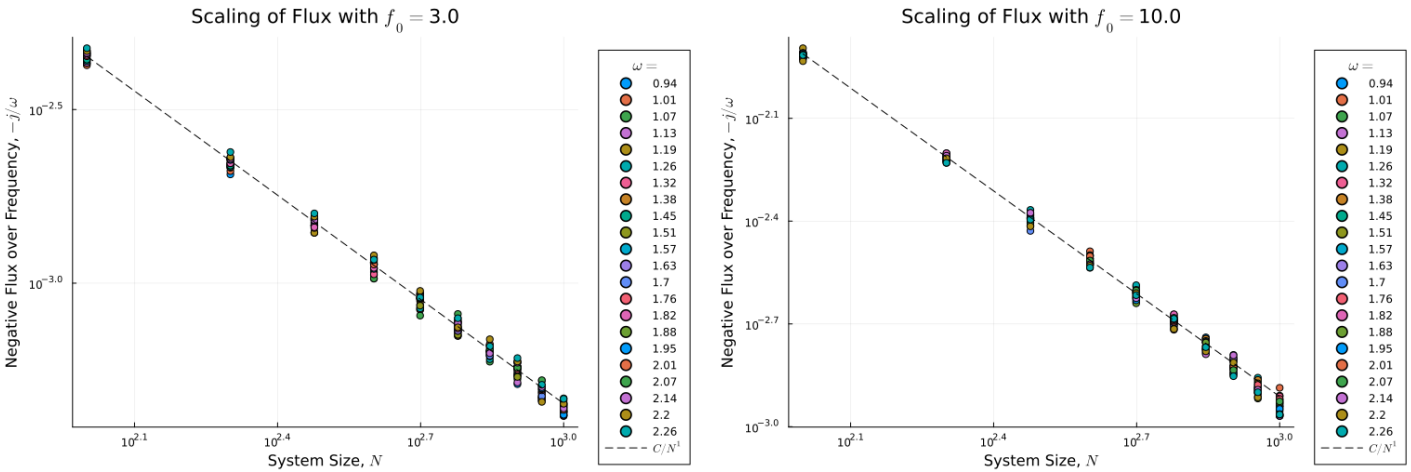


Figure: The scaling of the numerically observed flux divided by forcing frequency

Merci pour votre attention!

Questions?

Bibliography

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