1D Slow oscillations (A<<C0) (Numerical)

Kink dynamics

Consider a system with only two kinks. According to the kink's dynamics model, their distance decays as

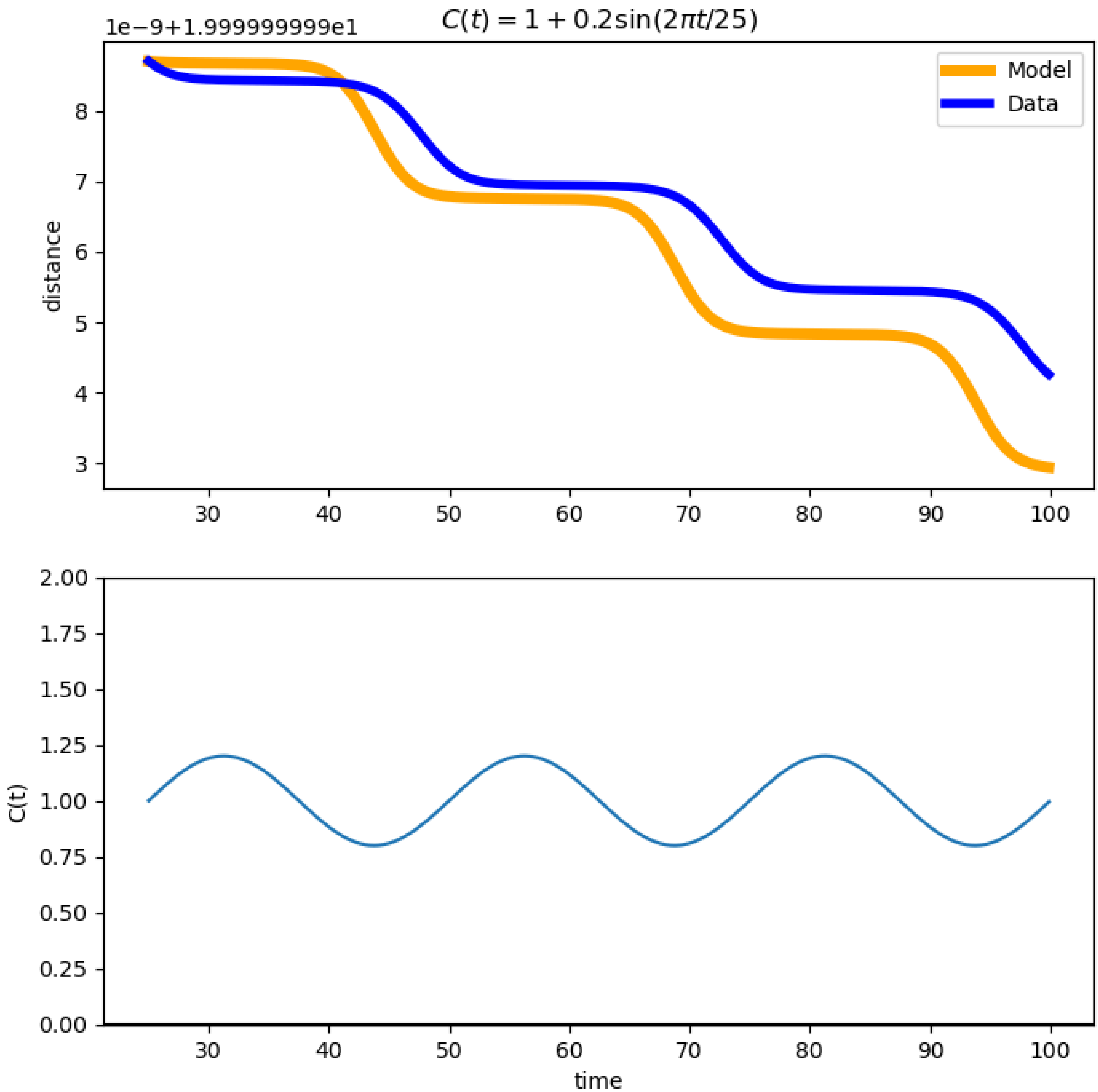
$$\dot{d}(t) \simeq -24\sqrt{2}C(t)^{\frac{1}{2}}[e^{-2^{\frac{1}{2}}C(t)^{\frac{1}{2}}d} - e^{-2^{1/2}C(t)^{1/2}(L-d)}]$$

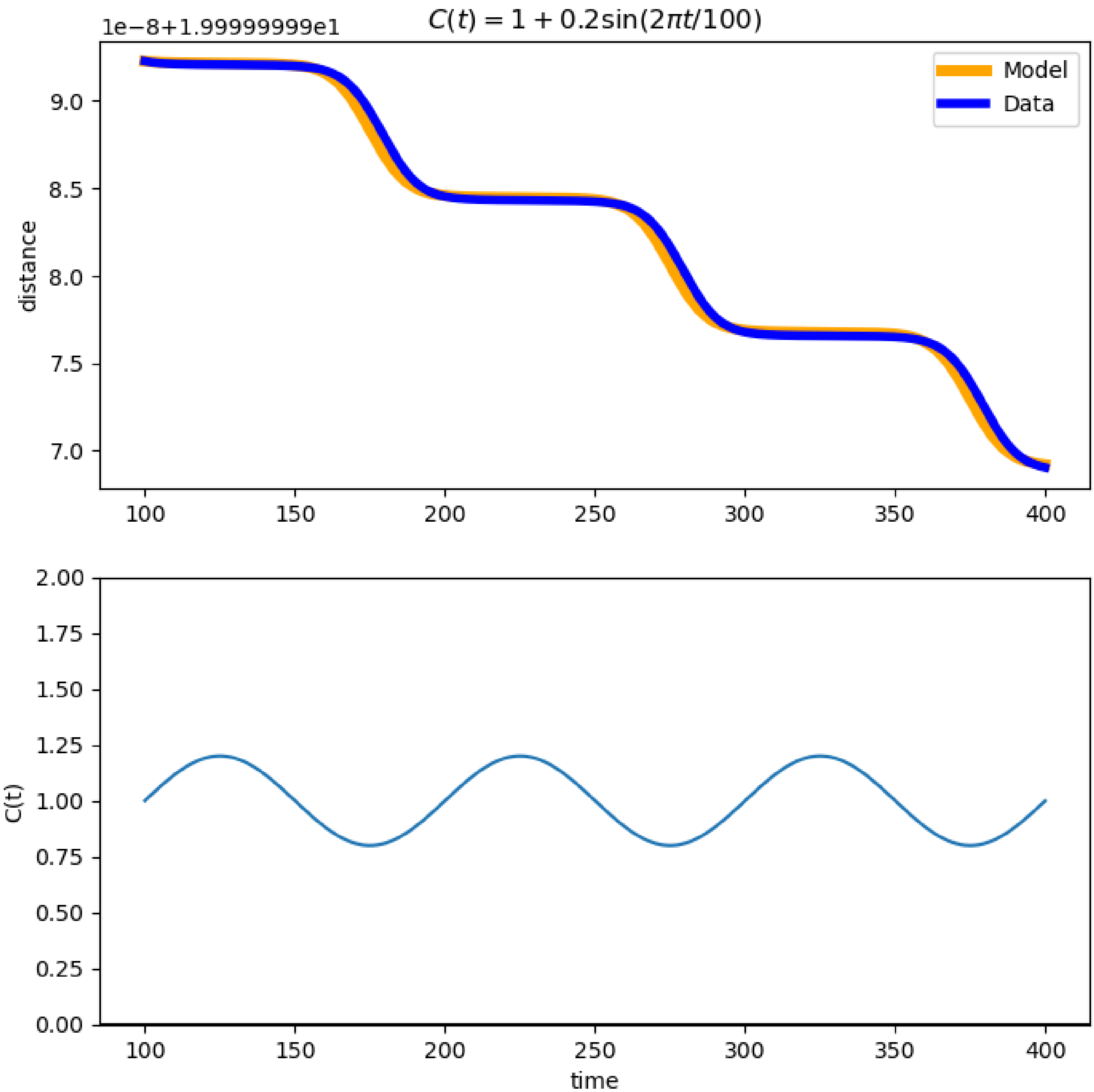
where L is the size of the simulation box.

Simulations

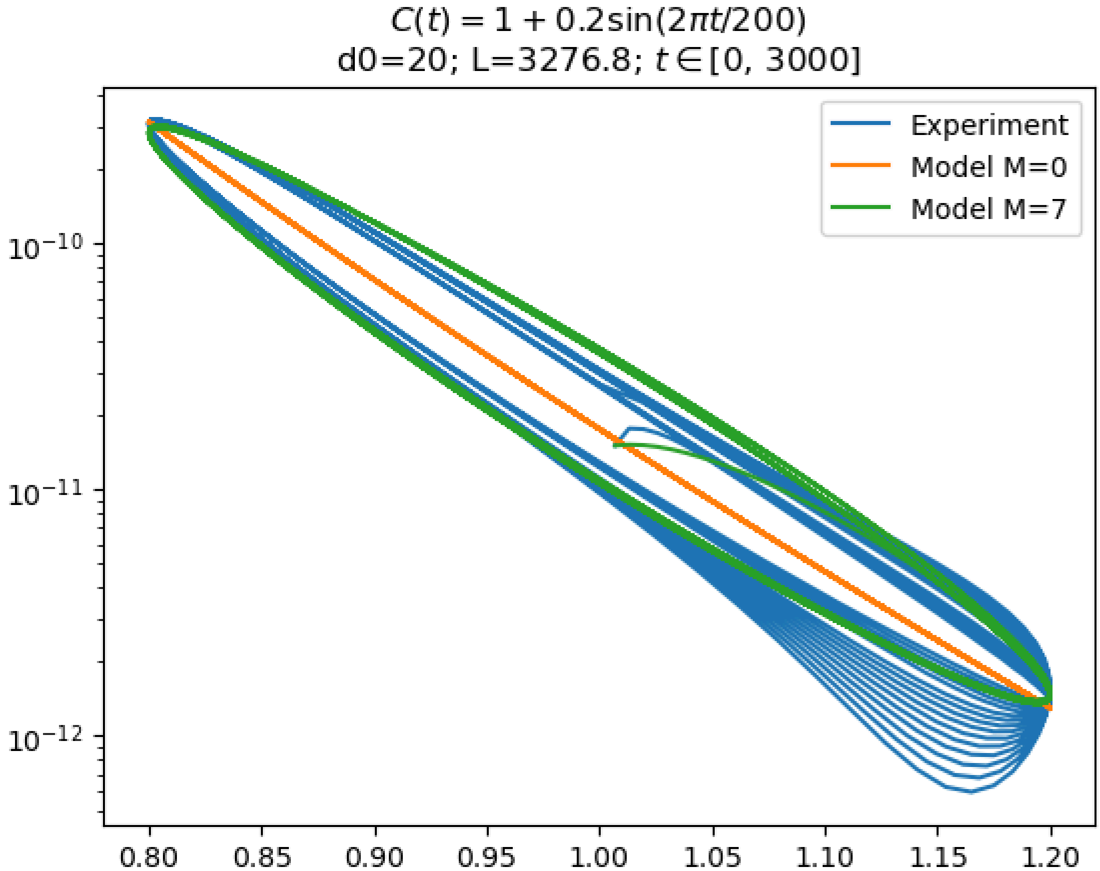
Distance as a function of time (steps)

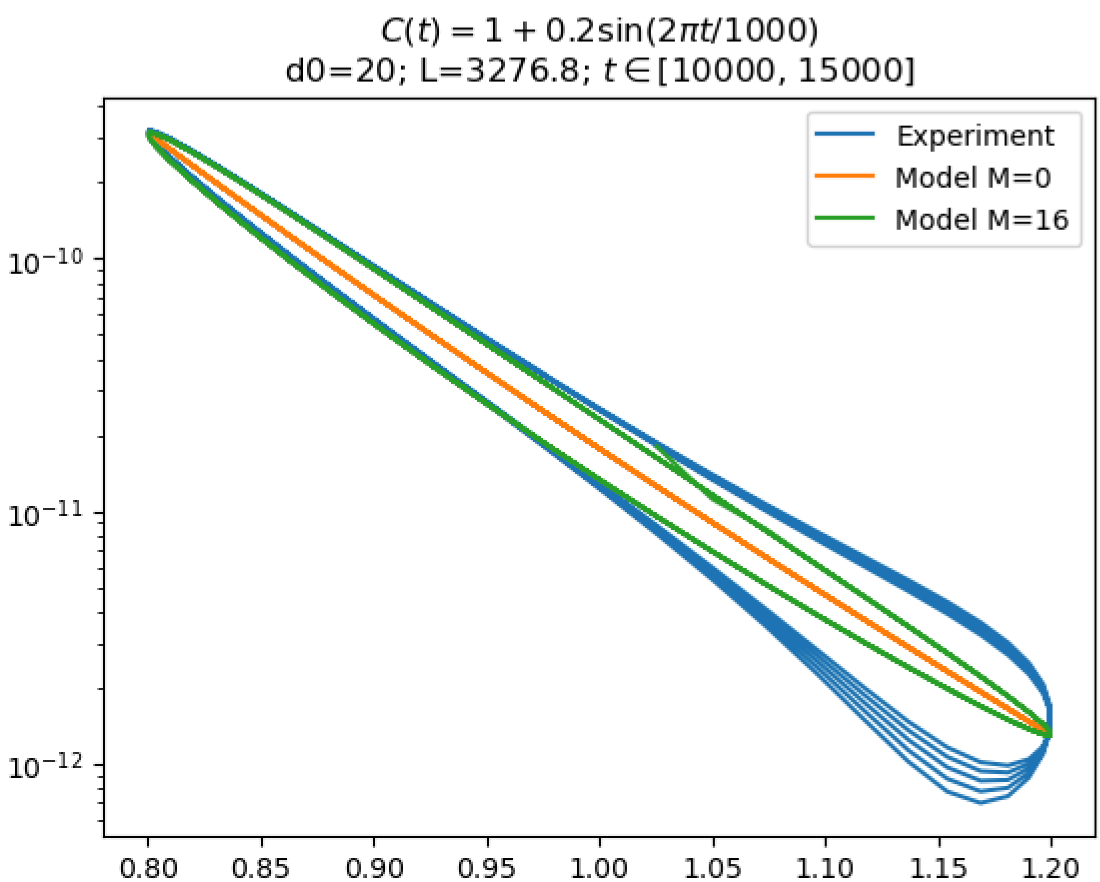
The model does **not** account for a "mass correction".





Velocity $-\partial_t d$ as a function of $C(t)$


$C(t) = 1 + 0.2\sin(2\pi t/200)$
d0=20; L=3276.8; $t \in [0, 3000]$
Experiment
Model M=0
Model M=7
10^{-10}
10^{-11}
10^{-12}
0.80
0.85
0.90
0.95
1.00
1.05
1.10
1.15
1.20


$C(t) = 1 + 0.2\sin(2\pi t/1000)$
d0=20; L=3276.8; $t \in [10000, 15000]$
Experiment
Model M=0
Model M=16
10^{-10}
10^{-11}
10^{-12}
0.80
0.85
0.90
0.95
1.00
1.05
1.10
1.15
1.20

Remarks

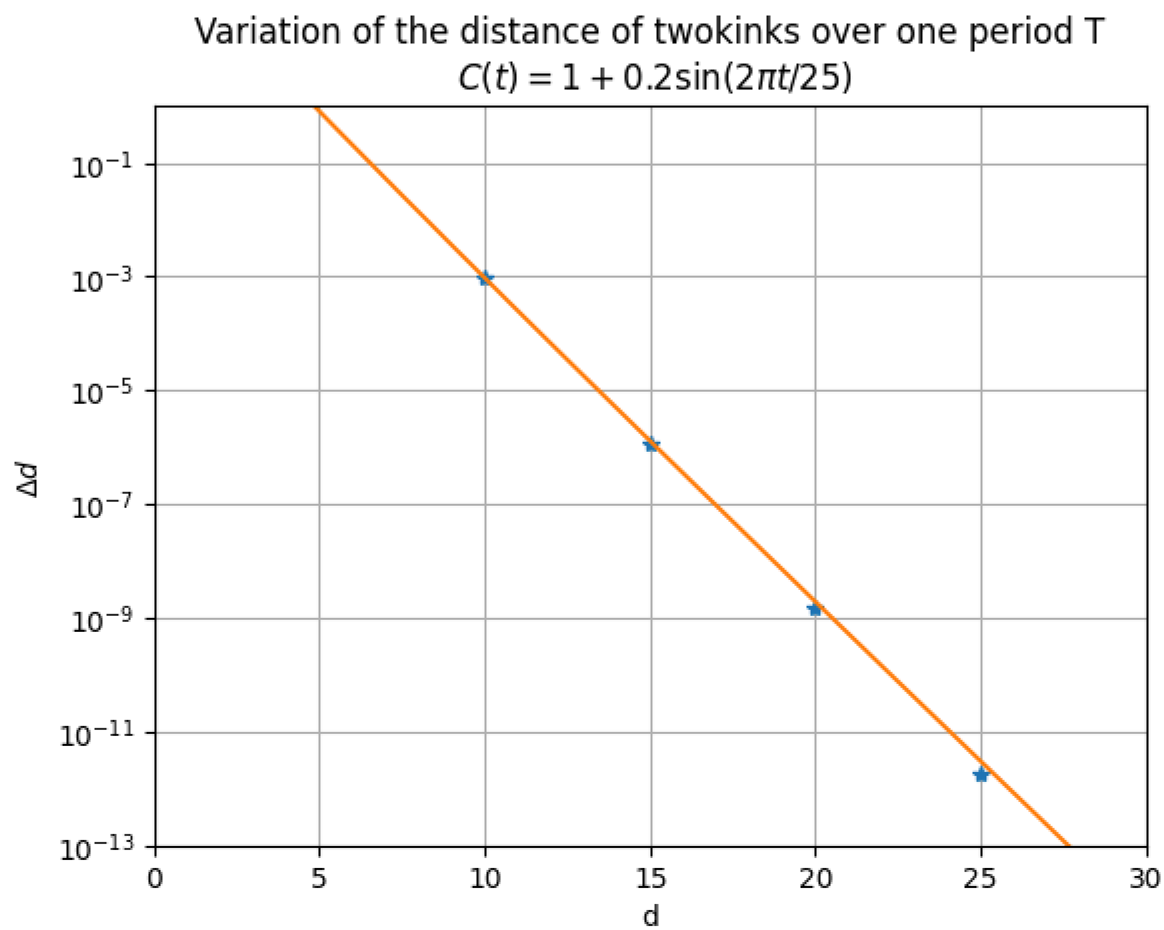
- **Deviation** scales as $\sim \epsilon$ (and not as $\sim \epsilon^2$ or slower).
- **Effect on the right** grows indefenetly with time.

Variation of the distance over a period

The variation of the distance over a period (assuming the distant to be constant inside the integrand)

$$\Delta d(d) = \int_0^T (\partial_t d) dt$$

- The **orange** line: is the kinks dynamics model's prediction.
- The **blue** dots: are the experimental values (simulations)
  To **collect the data**
- Simulation of $\sim 10^2 T$ seconds were launched for many values of the initial distance d_0
- The quantity Δd has
- been calculated considering data with $t > 10T$, to cancel the influence of the initial state's preparation.
- The value displayed on the x-axis is the distance at the beginning of the period.



Linear dynamics

$$\ell = \frac{2\pi}{< q^2 >^{1/2}} \sim t^{1/2}$$

$$\tau_{linear} \sim C(t)^{-1}$$