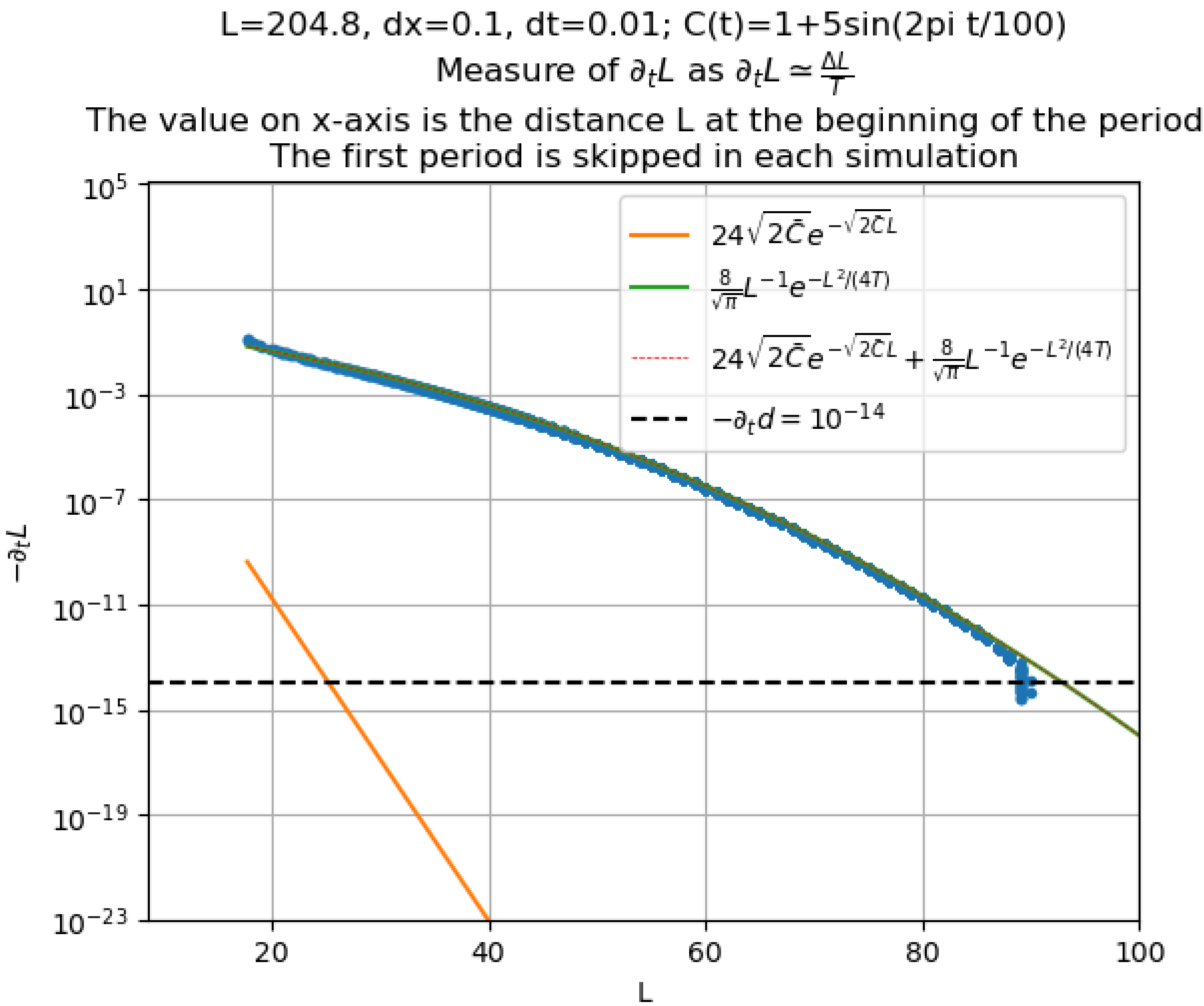
1D Slow oscillations (A>>C0) (Numerical)

Two coarsening laws

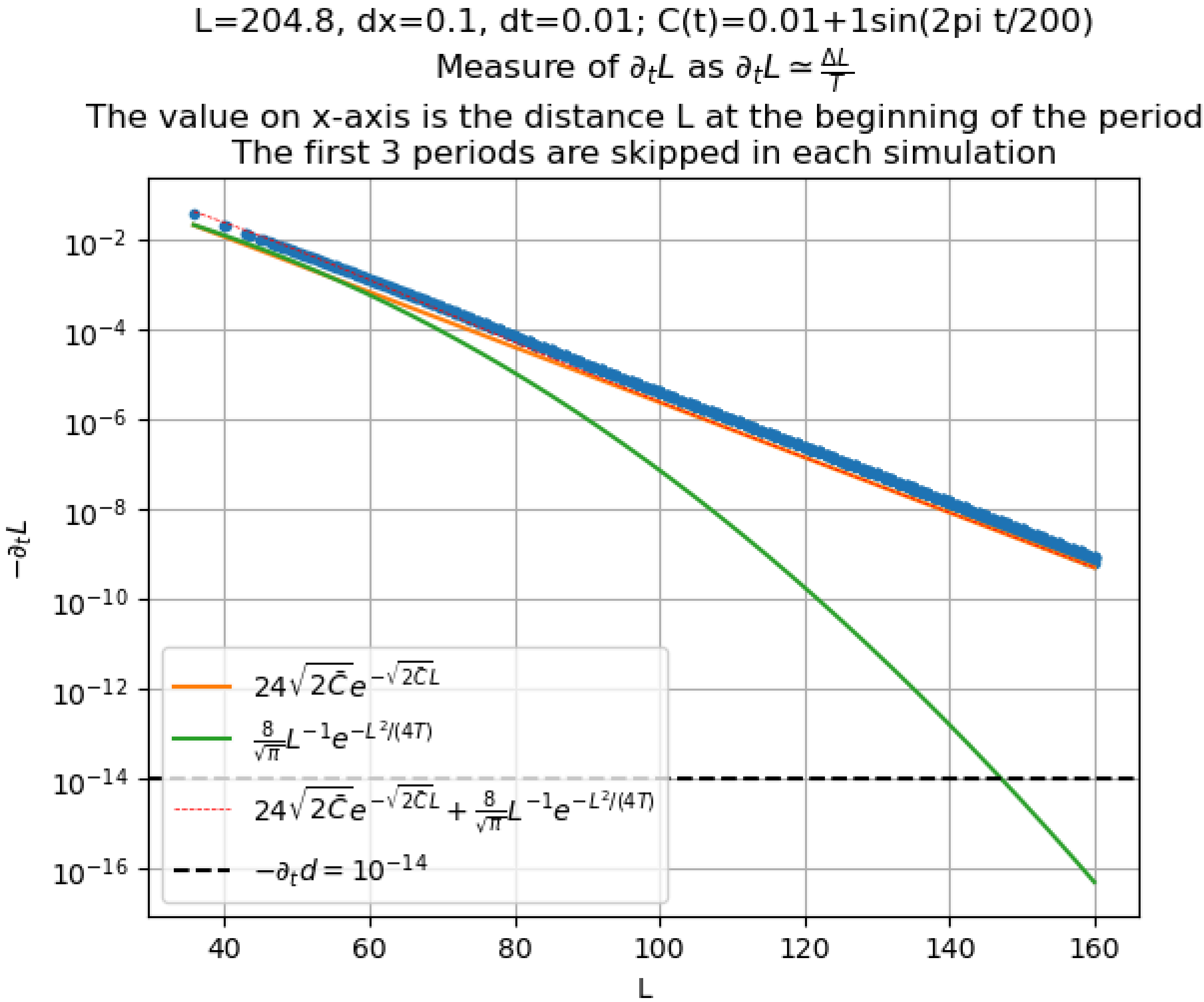
- **Small** distances $L \ll L_2^* = 4\sqrt{2}\bar{C}^{1/2}kT$ $\quad k = \left(1 - \frac{1}{\sqrt{\pi}}\left(\frac{C_0}{A}\right)^{1/2}\right)$ for $A \gg C_0$

  Example: $L_1^* = 40, L_2^* = 40\sqrt{2}, T = \bar{C}^{-1}$



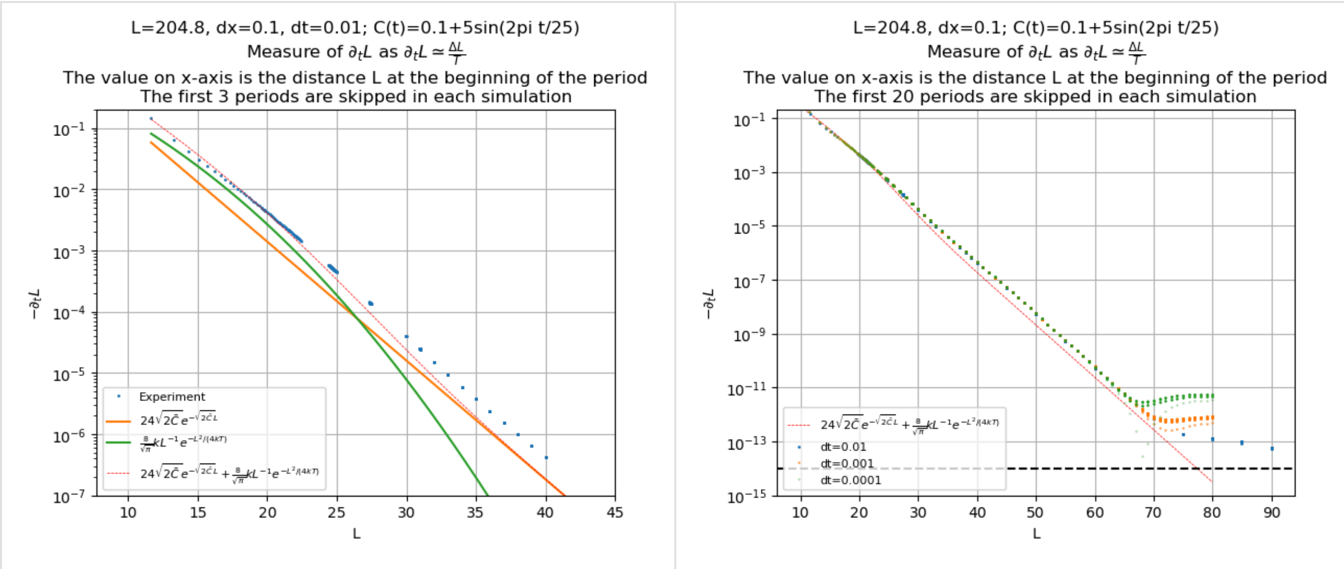
- **Large** distances $L \gg L_2^*$

  Example: $L_1^* = 40\sqrt{2}, L_2^* = 120\sqrt{2}, T = 2\bar{C}^{-1}$



NOT a numerical effect

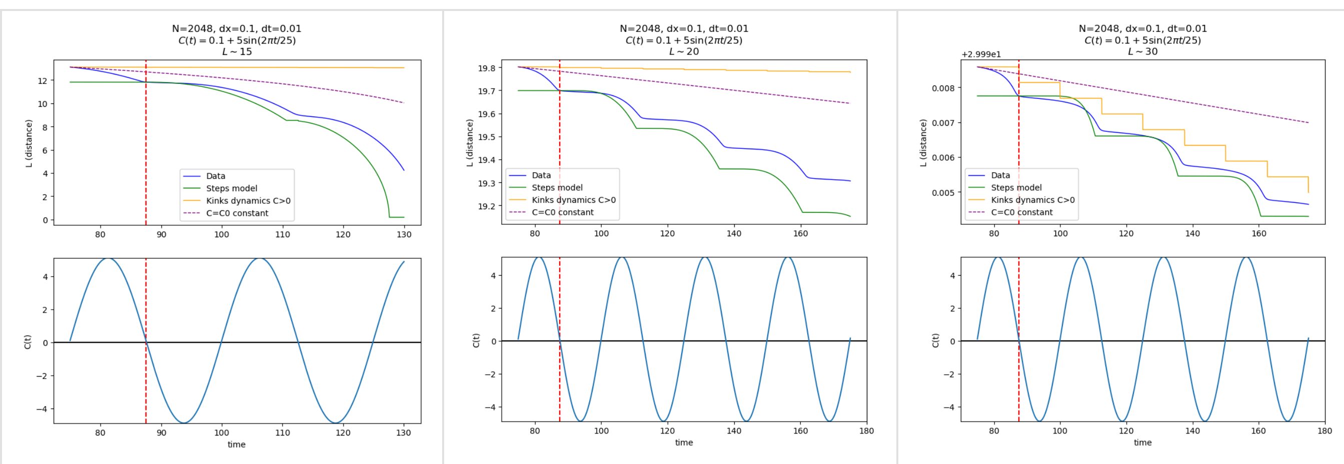
The nature of experimental data does not change by decreasing dt.
The variation we see, happens when $\partial_t L$ is around the floating point error value 10^{-14} that happens to be **far** from the crossing point for these choice of the parameters.



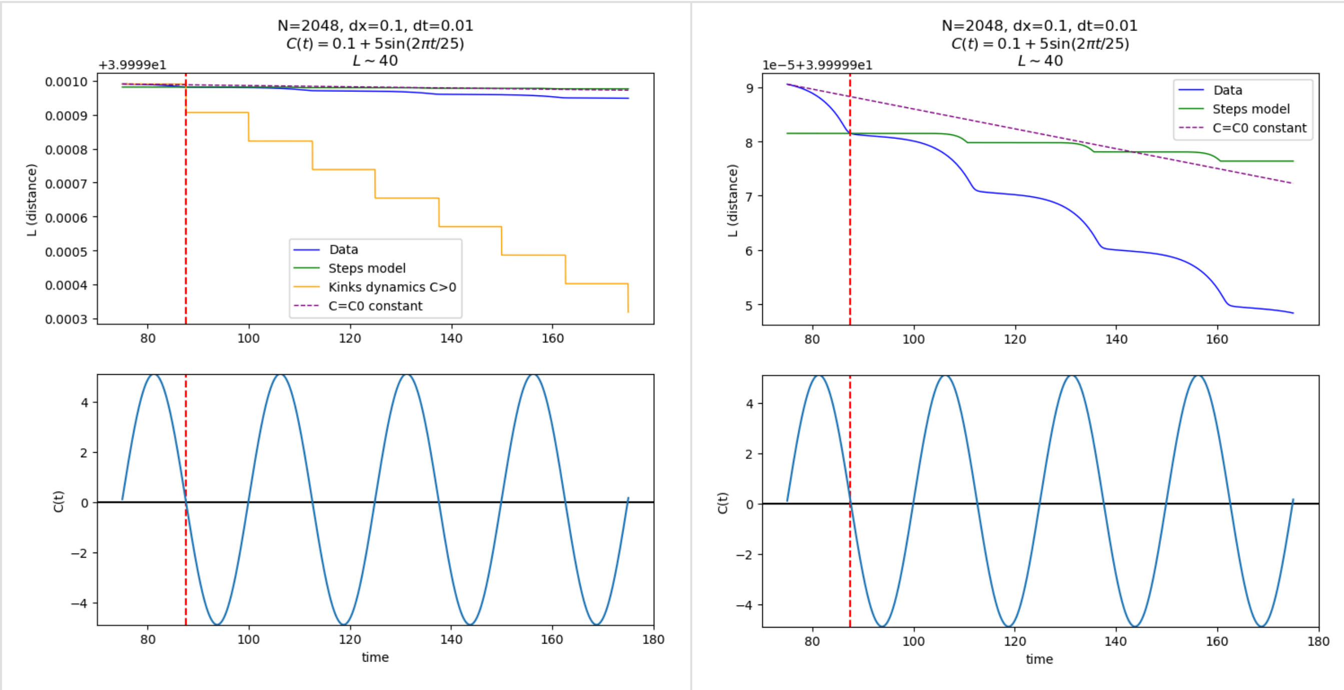
Decay of the distance

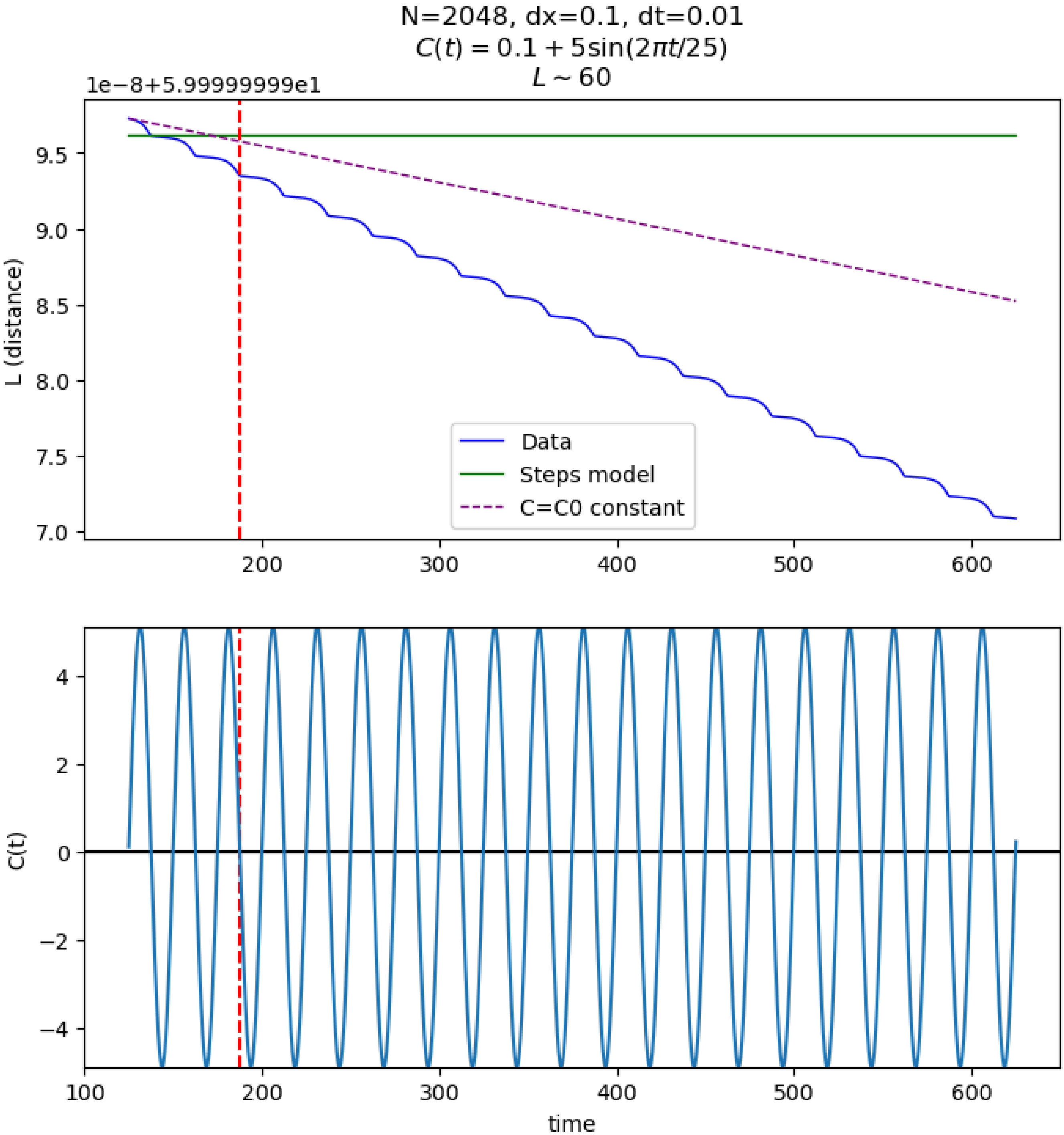
Notice that here the kink dynamics with constant C is purple, instead above is orange!

- When $L < L_2^* \simeq 41$
  The steps model (linear dynamics evolution of erf-shaped kinks) is the best one (coherent with what we see above). It becomes less and less accurate each period , because ΔL over a period is underestimated (as the steps are not the only effect present).

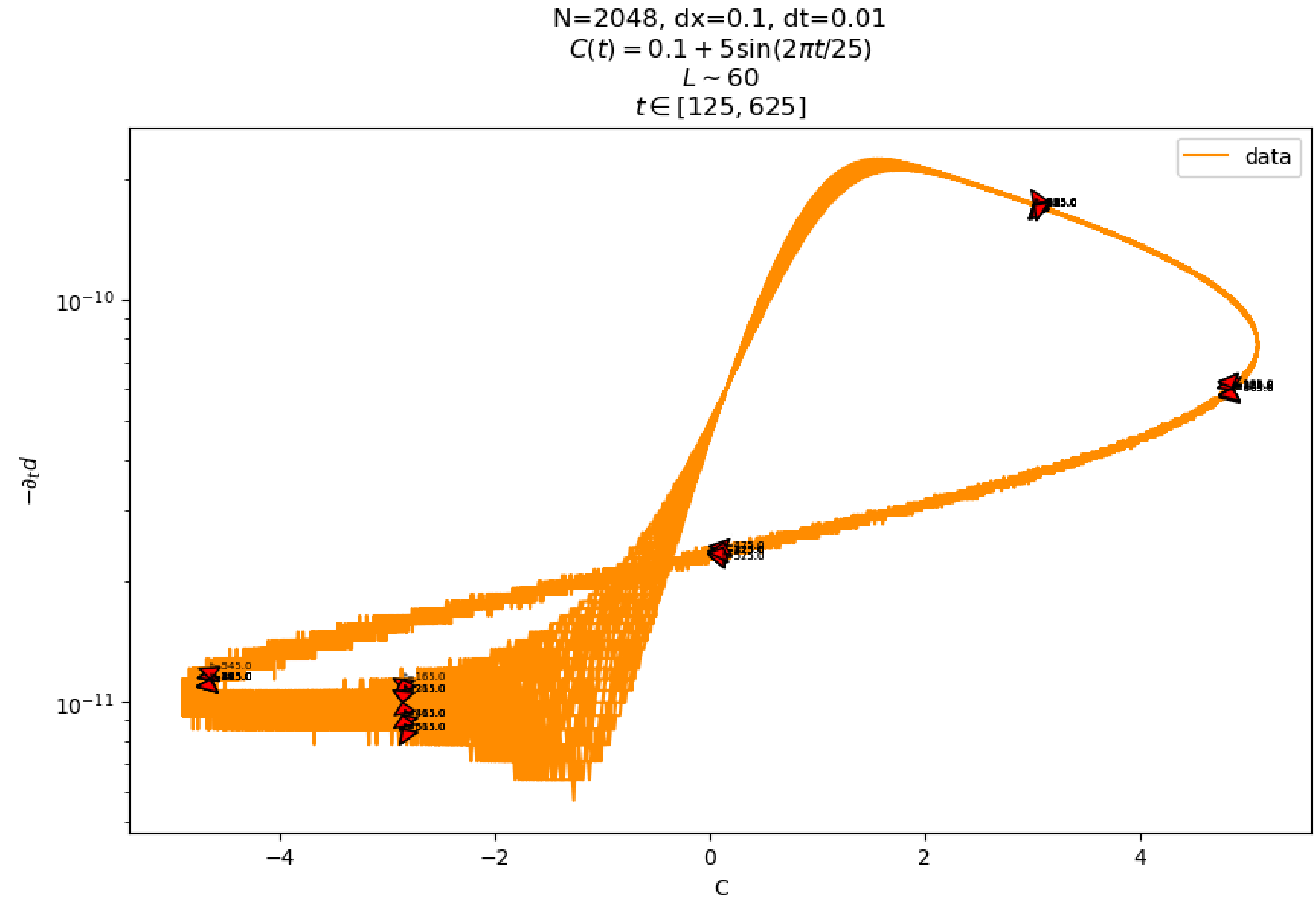


- When $L > L_2^*$
  The slope of the kinks model with $C = \bar{C}$ constant best estimates the slope of the experimental decay. The purple slope is slighly lower than the experimental slope and this is coherent with the fact that the purple line underestimates ΔL (as you can see above)


N=2048, dx=0.1, dt=0.01
$C(t) = 0.1 + 5\sin(2\pi t/25)$
$L \sim 40$
+3.9999e1
L (distance)
Data
Steps model
Kinks dynamics C>0
C=C0 constant
C(t)
time
N=2048, dx=0.1, dt=0.01
$C(t) = 0.1 + 5\sin(2\pi t/25)$
$L \sim 40$
1e−5+3.99999e1
L (distance)
Data
Steps model
C=C0 constant
C(t)
time



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

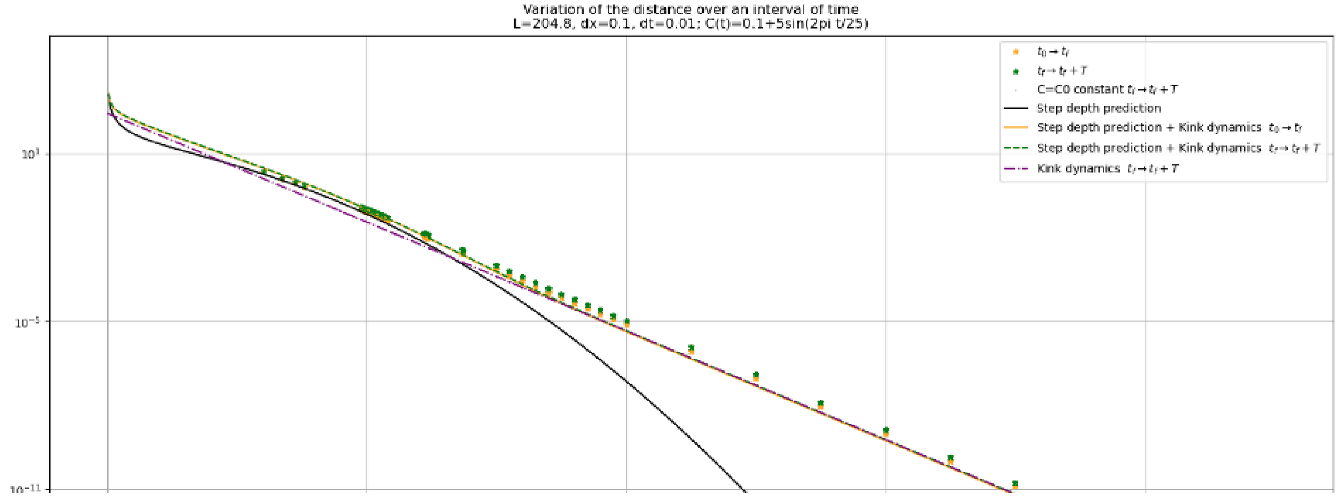


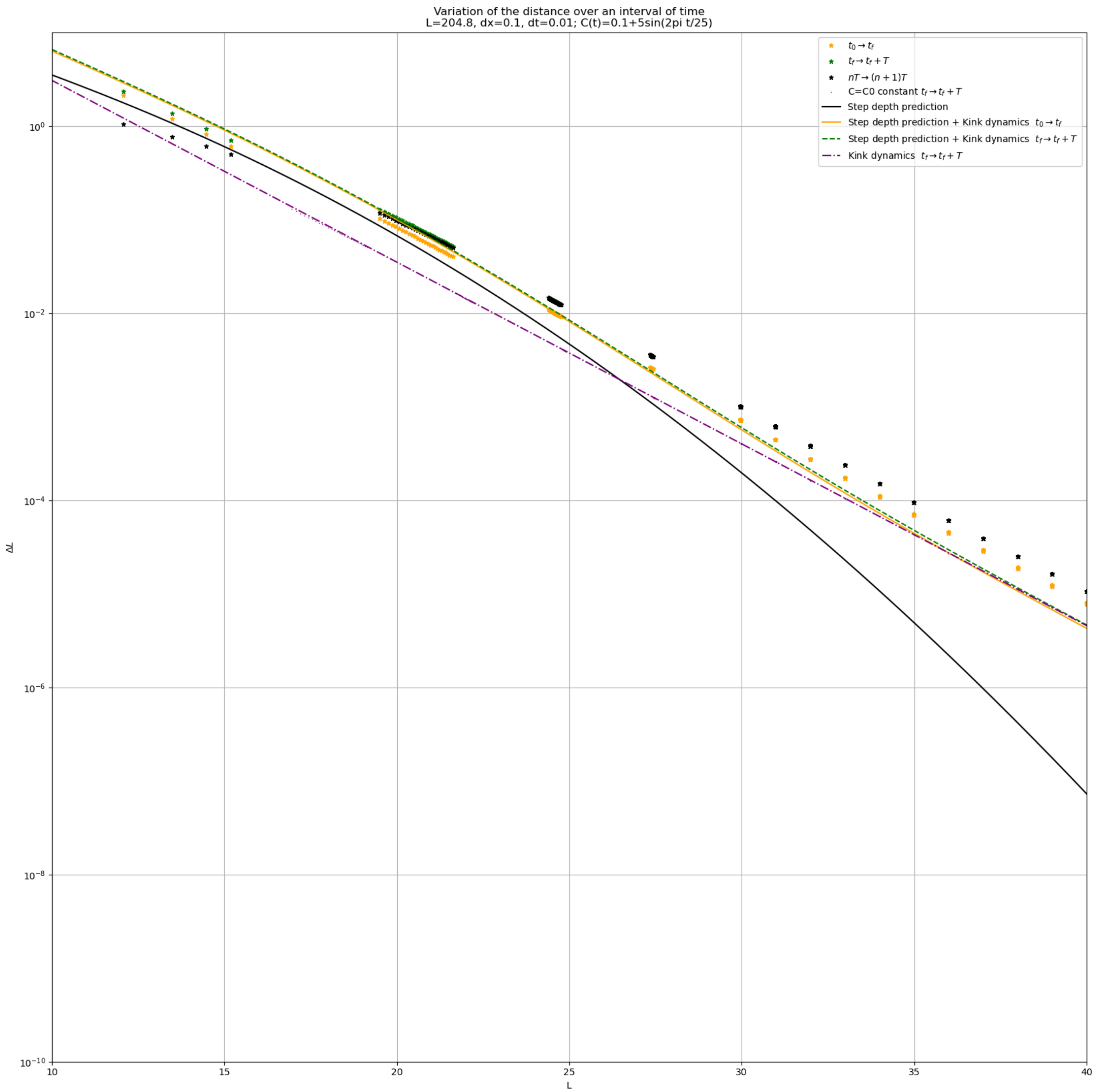
Variation of the distance over a period

Here different windows of time are considered for the measure of $\Delta L(L)$ that is a function of L: the distance at the beginning of the window of time.

An alternation of kink dynamics and step dynamics cannot explain the data

We can consider that, during the step duration the decay $d(t)$ is well described by the linear dynamics with the erf-shaped kink ansatz, while in the complementary region of each period, the decay $d(t)$ is described by kink dynamics with slow oscillatinh $C(t)$ (as here $C(t) \gg C_0$ we expect this model to work in this time interval).
But this idea is a failure, as we can see that, in the asymptotic region (where kink dynamics is much faster than step dynamics), we have kink dynamics also in the time interval where we expect step dynamics.


Variation of the distance over an interval of time
L=204.8, dx=0.1, dt=0.01; C(t)=0.1+5sin(2pi t/25)
$t_0 \to t_f$
$t_f \to t_f + T$
C=C0 constant $t_f \to t_f + T$
Step depth prediction
Step depth prediction + Kink dynamics $t_0 \to t_f$
Step depth prediction + Kink dynamics $t_f \to t_f + T$
Kink dynamics $t_f \to t_f + T$
10^{1}
10^{-5}
10^{-11}


Variation of the distance over an interval of time
L=204.8, dx=0.1, dt=0.01; C(t)=0.1+5sin(2pi t/25)
$t_0 \to t_f$
$t_f \to t_f + T$
$nT \to (n+1)T$
C=C0 constant $t_f \to t_f + T$
Step depth prediction
Step depth prediction + Kink dynamics $t_0 \to t_f$
Step depth prediction + Kink dynamics $t_f \to t_f + T$
Kink dynamics $t_f \to t_f + T$
ΔL
10^{0}
10^{-2}
10^{-4}
10^{-6}
10^{-8}
10^{-10}
10
15
20
25
30
35
40
L

Coarsening

$$C(t) = 1 + A\sin\left(\frac{2\pi t}{100}\right)$$