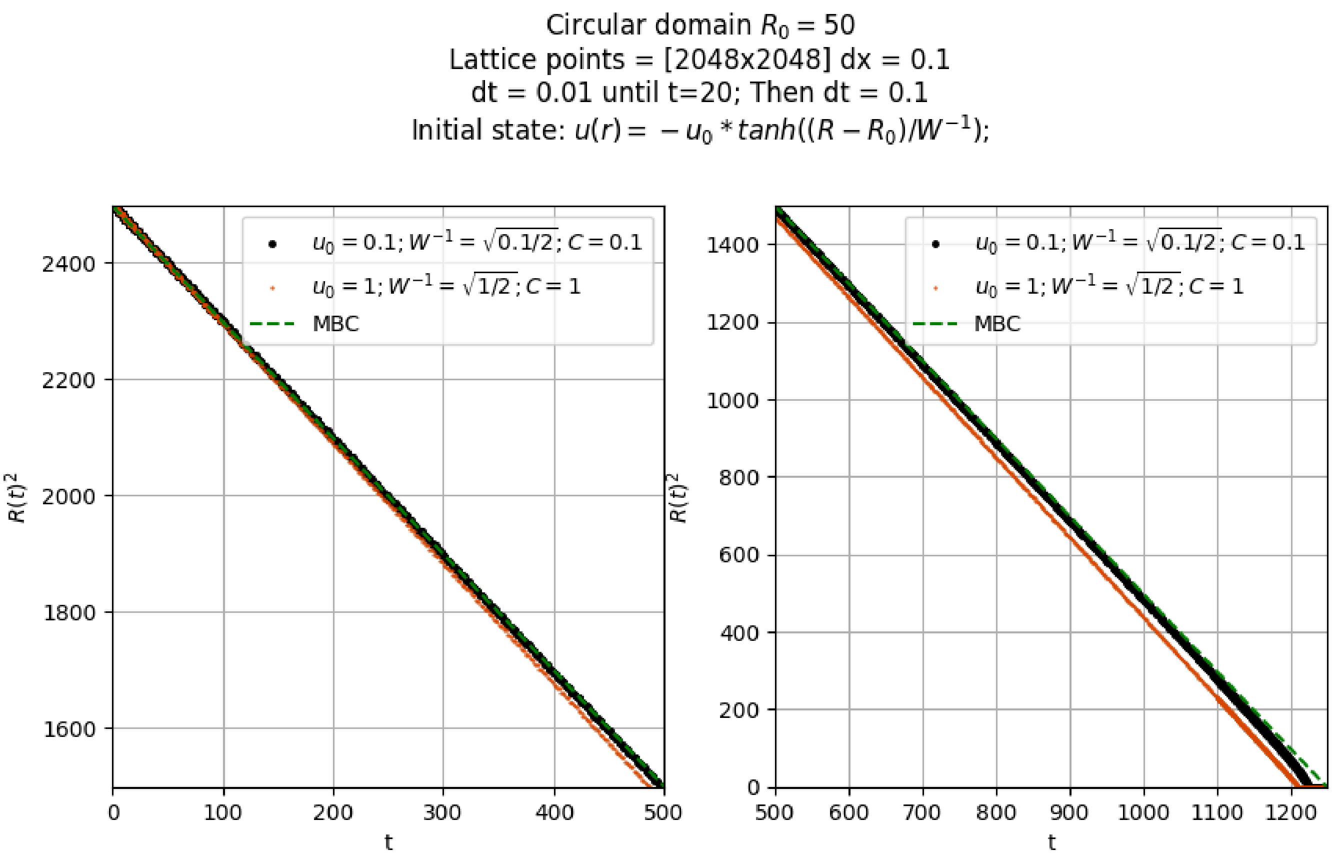
Motion by curvature corrections

#mbc #2D #circular_island

A leading (first) order effect

Motion by curvature is a **first (leading) order effect** [Motion by curvature](), in the limit where the **curvature** $\kappa = 1/R$ **is small.** So, close to the disappearance of the circular domain, when R gets small, deviations from $R^2(t) = R_0^2 - 2t$ are expected. And **these deviations may depend on the value of** C, even if at leading order (MBC) there is no dependence on C.
So, if we compare experiments with constant C, but with different values, it is not unexpected that the curve differ at long times, like it happens here:



Do C(t) oscillations introduce relevant corrections?

We know **analyticaly** that:

- If $\bar{C} > 0$ and the oscillations are fast respect to the dynamics
- If $C(t) > 0$ and the oscillations are slow
  The MBC law $\dot{R} = -R^{-1}$ still holds at leading order (explicit what is leading order). So

> The **"positive" oscillations** introduce only **second order corrections** to MBC.

While **we have no theory** for the case when

- $\bar{C} > 0$ but $C(t) < 0$ sometimes, with oscillations that are slow
  And
- We are not taking care about the *intermediate* between fast and slow
- If $C(t) > 0$ but sometimes it gets very close to zero, then the time scale $\tau_C \sim C^{-1}$ changes a lot (respect to the period T) during the simulation and so the oscillation is neither fast neither slow. This case is **not investigated** still.

Here we see, numerically, a comparison of "positive", "negative" oscillations and C constant, to answer the question

> Do negative oscillations introduce leading order corrections to the MBC or the correction is of the same order of the one you get with positive oscillations, and so of second order?