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CORRECTION

Correction to: Global Attractors of Sixth Order PDEs Describing the Faceting of Growing Surfaces

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Correction to: J Dyn Diff Equat (2016) 28:49–67 https://doi.org/10.1007/s10884-015-9510-6

The original version of this article, unfortunately, contained an error.

In [1], we studied

$$\begin{array}{ll} h_t = \frac{\delta}{2}|\nabla h|^2 + \Delta(\Delta^2 h - \Delta \mathrm{div}\, D_F W(\nabla h)) & \text{in } \Omega \times \mathbb{R}_+, \\ h(x,0) = h_0(x) & \text{for } x \in \Omega, \end{array} \tag{1}$$

for $\Omega = (0, L)^d$, $d = 1$ or $d = 2$ with periodic boundary conditions. The nonlinearity had the following form,

$$\begin{array}{ll} W(F) = \frac{1}{4}(F^2 - 1)^2, & d = 1, \\ W(F_1, F_2) = \frac{\alpha}{12}(F_1^4 + F_2^4) + \frac{\beta}{2}F_1^2 F_2^2 - \frac{1}{2}(F_1^2 + F_2^2) + A, & d = 2, \end{array}$$

where $\alpha, \beta > 0$ are anisotropy coefficients.

The way to obtain long-time results was through the study of the differentiated system (1), $u = \nabla h$, i.e. we differentiated (1) with respect to x. Here is the resulting problem,

$$\begin{array}{ll} u_t = \frac{\delta}{2}\nabla|u|^2 + \Delta^3 u - \nabla\Delta \mathrm{div}\, D_u W(u) & \text{in } \Omega \times \mathbb{R}_+, \\ u(x,0) = u_0(x) & \text{for } x \in \Omega, \end{array} \tag{2}$$

where $u = (u_1, u_2) = (h_x, h_y)$ (resp. $u = h_x$), if $d = 2$, (resp. $d = 1$).

The original article can be found online at https://doi.org/10.1007/s10884-015-9510-6.

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We proved in [1] the following result about (2).

Theorem 1 *([1, Theorem 4], [1, Theorem 5]) Let us consider* $\Omega = (0, L)^d$ *with* $d = 1, 2$ *and* $L > 0$ *arbitrary. The semigroup* $S(t) : \dot{H}^2_{per}(\Omega) \to \dot{H}^2_{per}(\Omega), u_0 \mapsto S(t)u_0 = u(t)$ *generated by equation (2) with periodic boundary conditions has a global attractor.*

We also claimed that the following result holds true.

Theorem 2 *([1, Theorem 6]) The semigroup generated by equation (1) has a global attractor in* H^3_{per} *for* $d = 1$ *and* $d = 2$.

However, this claim is not valid, because if h is solution to (1), then due to [1, Lemma 13] we know that $\nabla h \in L^2(0, T; \dot{H}^5_{per})$ and integration of (1) over Ω yields,

$$\frac{d}{dt}\int_\Omega h(x,t)\,dx = \int_\Omega \frac{\partial h}{\partial t}(x,t)\,dx = \int_\Omega \delta|\nabla h|^2\,dx \geq 0.$$

However, $\frac{d}{dt}\int_\Omega h(x,t)\,dx = 0$ if and only if $h \equiv const.$ Moreover, $h = const.$ is a steady state of (1). As a result, if h is not a constant steady state, then

$$0 < \frac{d}{dt}\int_\Omega h(x,t)\,dx.$$

This fact was overlooked in [1], making the claim in Theorem 2 invalid.

Reference

1. Korzec, M.D., Nayar, P., Rybka, P.: Global attractors of sixth order PDEs describing the faceting of growing surfaces. J. Dyn. Differ. Equ. **28**, 49–67 (2016)

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