

Accepted Manuscript

Pathwise upper semi-continuity of random pullback attractors along the time axis

Hongyong Cui, Peter E. Kloeden, Fuke Wu

PII: S0167-2789(17)30589-4
DOI: <https://doi.org/10.1016/j.physd.2018.03.002>
Reference: PHYSD 32014

To appear in: *Physica D*

Received date: 1 November 2017

Accepted date: 5 March 2018

Please cite this article as: H. Cui, P.E. Kloeden, F. Wu, Pathwise upper semi-continuity of random pullback attractors along the time axis, *Physica D* (2018), <https://doi.org/10.1016/j.physd.2018.03.002>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



Pathwise upper semi-continuity of random pullback attractors along the time axis

Hongyong Cui, Peter E. Kloeden and Fuke Wu*

*School of Mathematics and Statistics,
Huazhong University of Science & Technology, Wuhan 430074, China*

Abstract

The pullback attractor of a non-autonomous random dynamical system is a time-indexed family of random sets, typically having the form $\{\mathfrak{A}_t(\cdot)\}_{t \in \mathbb{R}}$ with each $\mathfrak{A}_t(\cdot)$ a random set. This paper is concerned with the nature of such time-dependence. It is shown that the upper semi-continuity of the mapping $t \mapsto \mathfrak{A}_t(\omega)$ for each ω fixed has an equivalence relationship with the uniform compactness of the local union $\cup_{s \in I} \mathfrak{A}_s(\omega)$, where $I \subset \mathbb{R}$ is compact. Applied to a semi-linear degenerate parabolic equation with additive noise and a wave equation with multiplicative noise we show that, in order to prove the above locally uniform compactness and upper semi-continuity, no additional conditions are required, in which sense the two properties appear to be general properties satisfied by a large number of real models.

Keywords: Random attractor, upper semi-continuity, local compactness, degenerate parabolic equation, wave equation.

2000 MSC: 35B40, 35B41, 37L30.

Contents

1	Introduction	2
2	Preliminaries: pullback attractors for non-autonomous random dynamical systems	3
3	Locally uniform compactness and upper semi-continuity in time	4
4	Parabolic example: degenerate parabolic equation with additive white noise	7
4.1	Functional spaces and preliminary results	8
4.2	NRDS generated by the SDPE	9
4.3	Joint continuity of the NRDS	10
4.4	Uniform estimates of solutions	11
4.5	The pullback attractor	14
4.5.1	Existence and construction	14
4.5.2	Locally uniform compactness and upper semi-continuity along the time axis	15
5	Hyperbolic example: wave equation with multiplicative white noise	15
5.1	Existence of the pullback attractor	17

Email address: h.cui@outlook.com, kloeden@math.uni-frankfurt.de, wufuke@hust.edu.cn (Hongyong Cui, Peter E. Kloeden and Fuke Wu*)

* Corresponding author.

Download English Version:

<https://daneshyari.com/en/article/8256218>

Download Persian Version:

<https://daneshyari.com/article/8256218>

[Daneshyari.com](https://daneshyari.com)