

## Accepted Manuscript

The scaling limits of the non critical strip wetting model

Julien Sohier

PII: S0304-4149(15)00062-9

DOI: <http://dx.doi.org/10.1016/j.spa.2015.02.012>

Reference: SPA 2757

To appear in: *Stochastic Processes and their Applications*

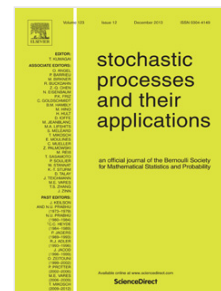
Received date: 13 June 2014

Revised date: 23 January 2015

Accepted date: 23 February 2015

Please cite this article as: J. Sohier, The scaling limits of the non critical strip wetting model, *Stochastic Processes and their Applications* (2015), <http://dx.doi.org/10.1016/j.spa.2015.02.012>

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.



\*Manuscript

# The scaling limits of the non critical strip wetting model.

Julien Sohier<sup>1</sup>,

*Technische Universiteit Eindhoven, P.O. Box 513, 5600 MB Eindhoven, The Netherlands.*

## Abstract

The strip wetting model is defined by giving a (continuous space) one dimensional random walk  $S$  a reward  $\beta$  each time it hits the strip  $\mathbb{R}^+ \times [0, a]$  (where  $a$  is a positive parameter), which plays the role of a defect line. We show that this model exhibits a phase transition between a delocalized regime ( $\beta < \beta_c^a$ ) and a localized one ( $\beta > \beta_c^a$ ), where the critical point  $\beta_c^a > 0$  depends on  $S$  and on  $a$ . In this paper we give a precise pathwise description of the transition, extracting the full scaling limits of the model. Our approach is based on Markov renewal theory.

*Keywords:* scaling limits for physical systems, fluctuation theory for random walks, Markov renewal theory.

*2000 MSC:* 60K15, 60K20, 60K05, 82B27, 60K35, 60F17.

## 1. Introduction and main results

### 1.1. Definition of the models

We consider  $(S_n)_{n \geq 0}$  a random walk such that  $S_0 := 0$  and  $S_n := \sum_{i=1}^n X_i$  where the  $X_i$ 's are i.i.d. and  $X_1$  has a density  $h(\cdot)$  with respect to the Lebesgue measure. We denote by  $\mathbf{P}$  the law of  $S$ , and by  $\mathbf{P}_x$  the law of the same process starting from  $x$ . We assume that  $h(\cdot)$  is continuous and bounded on  $\mathbb{R}$ , that  $h(\cdot)$  is positive in a neighborhood of the origin, that  $\mathbf{E}[X] = 0$  and that  $\mathbf{E}[X^2] =: \sigma^2 \in (0, \infty)$ . We fix  $a > 0$  in the sequel.

The fact that  $h$  is continuous and positive in the neighborhood of the origin entails that

$$n_0 := \inf_{n \in \mathbb{Z}^+} \{(\mathbf{P}[S_n > a], \mathbf{P}[-S_n > a]) \in (0, 1)^2\} < \infty. \quad (1)$$

For  $N$  a positive integer, we consider the event  $\mathcal{C}_N := \{S_1 \geq 0, \dots, S_N \geq 0\}$ . We define the probability law (the *free wetting model in a strip*)  $\mathbf{P}_{N,a,\beta}^f$  on  $\mathbb{R}^N$  by

$$\frac{d\mathbf{P}_{N,a,\beta}^f}{d\mathbf{P}} := \frac{1}{Z_{N,a,\beta}^f} \exp \left( \beta \sum_{k=1}^N \mathbf{1}_{S_k \in [0,a]} \right) \mathbf{1}_{\mathcal{C}_N} \quad (2)$$

*Email address:* jusohier@gmail.com (Julien Sohier)

Download English Version:

<https://daneshyari.com/en/article/10527316>

Download Persian Version:

<https://daneshyari.com/article/10527316>

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