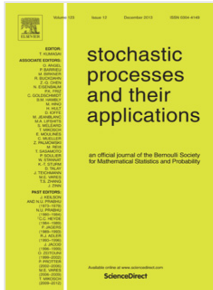
# Accepted Manuscript

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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

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

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**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

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

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

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

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