

# On the Layering Transition of an SOS Surface Interacting with a Wall.

## II. The Glauber Dynamics

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**Abstract:** We continue our study of the statistical mechanics of a 2D surface above a fixed wall and attracted towards it by means of a very weak positive magnetic field  $h$  in the solid on solid (SOS) approximation, when the inverse temperature  $\beta$  is very large. In particular we consider a Glauber dynamics for the above model and study the rate of approach to equilibrium in a large cube with arbitrary boundary conditions. Using the results proved in the first paper of this series we show that for all  $h \in (h_{k+1}^*, h_k^*)$  ( $\{h_k^*\}$  being the critical values of the magnetic field found in the previous paper) the gap in the spectrum of the generator of the dynamics is bounded away from zero uniformly in the size of the box and in the boundary conditions. On the contrary, for  $h = h_k^*$  and free boundary conditions, we show that the gap in a cube of side  $L$  is bounded from above and from below by a negative exponential of  $L$ . Our results provide a strong indication that, contrary to what happens in two dimensions, for the three dimensional dynamical Ising model in a finite cube at low temperature and very small positive external field, with boundary conditions that are opposite to the field on one face of the cube and are absent (free) on the remaining faces, the rate of exponential convergence to equilibrium, which is positive in infinite volume, may go to zero exponentially fast in the side of the cube.

### 0. Introduction

This paper is the second part of a work, begun in [CM], about the equilibrium and non-equilibrium statistical mechanics of a SOS surface above a fixed wall at low temperature and attracted towards it by a very weak external field.

Although the problem is clearly relevant for the understanding of wetting phenomena (see e.g. [FP1, FP2]) and, more generally, for the study of two dimensional interfaces, our main motivation originates from the study of the ergodic