



# Lectures on singular stochastic PDEs

Massimiliano Gubinelli

Nicolas Perkowski

**Abstract.** These are the notes for a course at the 18th Brazilian School of Probability held from August 3rd to 9th, 2014 in Mambucaba. The aim of the course is to introduce the basic problems of non-linear PDEs with stochastic and irregular terms. We explain how it is possible to handle them using two main techniques: the notion of energy solutions in [Gonçalves and Jara, *Arch. Ration. Mech. Anal.*, 2014] and [Gubinelli and Jara, *Stoch. Partial Diff. Equations: Analysis and Computations*, 2013], and that of paracontrolled distributions, recently introduced in [Gubinelli, Imkeller, and Perkowski, *Forum Math. Pi*, 2015]. In order to maintain a link with physical intuitions, we motivate such singular SPDEs via a homogenization result for a diffusion in a random potential.