Real and Complex Gaussian Multiplicative Chaos

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Level: Advanced

Pre-requisite: Probability theory (solid background including Martingale theory), Functional analysis (basic notions).

The main objective this series of lecture it provide to a general audience an introduction to Gaussian Multiplicative Chaos, a random process which was introduced in the 80's by Kahane and attracted a lot of attention in the last decade due to its connection with the physical theory of 2D-Quantum gravity. The course requires a solid background in probability theory (including Martingale theory) and a few basic notions of functional analysis, but no prior knowledge of Gaussian Free Field.

Our five 5 lectures of 60 minutes would be organized as follows:

1. Physical motivation, Gaussian Free Field and Gaussian Multiplicative chaos (GMCh).

2. Gaussian Multiplicative Cascades: a hierarchical version of the model.

3-4. Complex GMCh and its phase portrait.

5. The collapse transitions for the quantum Sine-Gordon model.