ID de Contribution: **68**

Type: **Non spécifié**

Nesting in the O(n) loop model on random maps of arbitrary topology

We consider self-avoiding loops on random maps, weighted by a parameter n. This so-called O(n) model contains as special case Ising, Potts, percolation, … As is well-known, it exhibits in the critical regime two universality classes, dilute or dense, and it is conjectured that the loop configurations are described to a coupling of CLE processes with parameter n = 2\cos\pi(1- 4/\kappa) with Liouville quantum gravity, with parameter 8/3 < \kappa < 4 in the dilute phase, and 4 < kappa < 8 in the dense phase – while n spans the interval (0,2).

I will review how these maps can be counted, first for disks and cylinders, then for any topology, and how to track the number of separating loops and the topology of nestings. More explicit computations can be carried for triangulations, possibly with bending energy for the loops. In the critical regime for large maps, we obtain the relative probability of the various nesting topology, as well as the large deviation of the number of separating loops along cylindric parts of the maps, which typically scale like ln(number of vertices), and the relati. In the case of number of separating loops in a pointed disks, taking into account the coupling to Liouville via KPZ formulas, this result perfectly agrees with the extreme nesting properties of the CLE obtained previously by Miller, Watson and Wilson.

This is based on several joint works, with Jeremie Bouttier, Bertrand Duplantier, Bertrand Eynard, Elba Garcia Failde, Emmanuel Guitter, and Nicolas Orantin

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