



Contribution ID: 4

Type: **not specified**

## Invited lecture 2 : Large random tilings of a hexagon with periodic weightings: steepest descent analysis on the double amoeba

*Wednesday 19 November 2025 11:30 (1 hour)*

We continue the study of the  $3 \times 3$ -periodic random hexagon tiling model from the previous talk by Arno Kuijlaars. There is a determinantal point process on the hexagon that is equivalent to the tiling model. The correlation kernel of this process has been expressed as a double contour integral by Maurice Duits and Arno Kuijlaars. This representation of the correlation kernel allows us to use steepest descent analysis to obtain large- $N$  asymptotics. It turns out that the position of the dominant saddle point determines the phase (solid, liquid, or gas) for a given asymptotic coordinate. We show that the liquid phase is homeomorphic to the (double) amoeba of a genus-one Harnack curve. This double amoeba is used to prove the existence of steepest descent (and ascent) paths when the asymptotic coordinate lies in the liquid region.

At the end of the talk, we give an outlook for the  $3 \times 3$ -periodic random tiling model on hexagons that are stretched in one direction. Depending on the direction, we observe two distinct cases of a splitting of the gas phase.

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