

Stochastique et interférences avec EDP et théorie du potentiel

Equipe :

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Activites:

- 2 visites scientifiques de deux semaines à l'Université Paris 13
- une visite scientifique de deux semaines à l'IMAR
- l'organisation d'un atelier de travail à Bucarest, en septembre-octobre 2018.

Projet de recherche

Processus de branchement-fragmentation et leur EDP

Abstract . In the present collaboration project, we intend to study fragmentation processes depending on several fragmentation kernels and on the position of the fragments in a given space, where a spatial movement given by a Markov process is fixed. The original element of considering multi-fragmentation processes has a strong motivation in the above relation we intend to show. Namely, the real-life model of a material rupture indicates that at each space position not only the fragmentation of the material occurs but also the energy is “fragmented”. Space position dependence have been previously considered rather for coagulation processes than for fragmentation. The final goal is to complete the above probabilistic approach with a numerical simulation.

The 2017 tasks: Lucian Beznea gave a talk entitled “*Processus de fragmentation multiple gouverné par un flow*” at the “Atelier de travail en stochastique et interférences avec EDP” (Bucarest, Septembre 13–14, 2017), where he presented results from a work in progress entitled “Multiple-fragmentation driven by a spatial Markov process” (authors: L. Beznea, I.R. Ionescu, and O. Lupascu). More precisely, we considered not only the fragmentation of the mass of a particle but also the kinetic energy. As a result, a one-dimensional fragmentation process is no longer an adequate model for our purpose. We made a numerical simulation for the evolution in time of a system of particles placed on an Euclidean surface.

Jean-Stephane Dhersin gave a talk entitled “*Théorème limite pour un modèle SIR sur un graphe aléatoire*” at the “Atelier de travail en stochastique et interférences avec EDP” (Bucarest, Septembre 13–14, 2017).

Oana Lupascu gave a talk entitled “*Equation stochastique de fragmentation et processus de branchement liés aux avalanches*” at the “Atelier de travail en stochastique et interférences avec EDP” (Bucarest, Septembre 13–14, 2017). It was presented a method for the construction of continuous space-time branching-fragmentation processes of all fragmentation sizes, induced either by a continuous or by discontinuous fragmentation kernels, leading to a stochastic model of the fragmentation phase of an avalanche.

The 2018 objective: In 2017 we studied the fragmentation processes depending on several fragmentation kernels and on the position of the fragments in a given space, where a spatial movement given by a (deterministic) right continuous flow, or equivalently, by a semi-dynamical system. The first aim is to complete this study by considering stochastic spatial movement, namely given by a fixed Markov process. Several simulations for the trajectories of the process are also expected. A system of stochastic differential equations for integro-differential operators will occur in a natural way. The second aim is to understand the corresponding space of all (multi-)fragmentation sizes in this situation, a convenient analogue of the space of J. Bertoin as considered in [*Stoch. Proc. Appl.* **25** (2015), 1861-1885] and [*J. Stat. Phys.* **162** (2016), 824-841], on which the forthcoming branching-fragmentation process will be constructed.