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A CONTINUUM INDIVIDUAL BASED MODEL OF FRAGMENTATION: MICRO- AND MESOSCOPIC DESCRIPTION.

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ABSTRACT

An individual-based model of an infinite system of point particles in $\mathbb{R}^d$ is discussed. In [1] there was introduced the model in which each particle randomly produces a finite number of new particles ('cloud') and disappears afterwards. The model considered here is a particular case of that model with the cloud being empty or consisting of exactly two offsprings, i.e., each cell can either split or die with intrinsic mortality rate or under the influence of other particles (competition). Models of this kind appear in population biology. The phase space for the model is the set Γ of all locally finite subsets of $\mathbb{R}^d$. The system's states are probability measures on Γ. To characterise evolution of such states we study evolution of observables – appropriate real functions F on Γ, by means of the Kolmogorov equation

$$\frac{d}{dt}F_t = LF_t, \qquad F_t|_{t=0} = F_0, \qquad t > 0.$$

The 'generator' L specifies the model. The Markov evolution of states is described in terms of their correlation functions in a scale of Banach spaces. The existence and uniqueness of solutions of the corresponding evolution equation are proved by using the Ovcyannikov's method. Modification of a method used in [3] is employed to show that the obtained solution corresponds to the unique state. There is also provided the mesoscopic description of the evolution obtained from the Kolmogorov equation by means of the Vlasov scaling and the results are compared with similar ones regarding the spatial logistic model discussed in [2].

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