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Moment closure in a Moran model with recombination

The dynamics of processes of population genetics is often well understood in the limit of infinite population size where a law of large numbers leads to a deterministic description. Great challenges arise in models with finite populations and interacting individuals. In these nonlinear models even the analysis of the expectation is difficult. Its dynamics does, usually, not only depend on the current expectation but on higher moments, and there is no moment closure.

In my talk, I will present an exception to this rule. I will consider a continuous-time Moran model with arbitrary recombination and mutation, but without resampling (i.e., genetic drift). In this case the expectations of products of marginal processes defined via partitions of sites form a closed hierarchy, which is exhaustively described by a finite system of differential equations. One thus has the exceptional situation of moment closure in a nonlinear system. Surprisingly, this property is lost when resampling is included.

References

[1] E. Baake, and T. Hustedt, *Moment closure in a Moran model with recombination*, submitted.