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SÉMINAIRE

Estimation of macroevolutionary rates from the fossil record

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Understanding the processes of speciation and extinction is a major challenge in evolutionary biology and methodological advances have been improving our ability to infer the dynamics of species diversification from dated phylogenies of extant taxa and from the fossil record. The interpretation of diversity trajectories through time, however, goes beyond the estimation of rates of speciation and extinction, and may involve complex processes of niche filling, correlated trait evolution, and biotic interactions. Here I present a new Bayesian framework to analyze fossil occurrence data and jointly estimate times of origin and disappearance of taxa and rates of speciation and extinction. Speciation and extinction rates can vary through time and their temporal dynamics can be decoupled. Simulations show that model selection and parameter estimation are robust in the presence of incomplete taxon sampling. The statistical framework is extended to allow hypothesis testing with a particular focus on exploring the effect of diversity dependent processes, trait-correlated diversification, and competition among clades. The method is tested on fossil data sets of three mammal clades (the Rhinocerotidae, Ursidae, and Canidae) investigating different aspects of their Cenozoic diversification.