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## Possible dispersal routes based on individual-based modeling forced with past climate conditions.

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It has long been hypothesized that long and short term climate changes influenced early human evolution and dispersal. With the use of paleoclimate, archeological, genetic, and climate model data, we can infer climate factors that influenced dispersal and possible migration routes. Recent research has shown that with the use of data from these different disciplines, we can model human dispersal and interactions with the environment at a group level. However, decision-based questions such as push vs. pull scenarios and what is the optimal time to move are challenging to answer using classical differential-equation based models. With the use of individual-based modeling (IBM), we can connect archeological research with paleoclimate (modeling) data and build possible dispersal scenarios.

IBM has long been used in ecology to research the overall behavior of a group based on decisions made by individuals. In IBMs, each individual is modeled as a discrete agent who decides its action based on the environment and relation to other agents, thereby allowing for more individual variation and adaptation than is possible with classical differential-equation and difference-equation models.

Here we present some preliminary results from our climate forced IBM. Climate variables such as net primary production, temperature, and rainfall were obtained from a transient simulation of the LOVECLIM intermediate climate model. These climate factors were used for movement decisions and influence the birthrate and life span of the agents. We show the most likely dispersal routes for different climate scenarios and the role of dispersal strategies (push vs. pull).