**Appendix S4. Details about null models performed to assess the statistical significance of sites covariance of the R-D plot through randomizations of PAMs for the present and future climate scenarios.**

In order to determine the statistical significance for values obtained from our R-D plot analyses, we generated 10,000 randomized PAMs for each climatic-dispersal ability scenario and compared the probability with which random values were similar to observed ones, assuming a significant difference at p ˂ 0.05. This randomization protocol uses a fill-based approach to produce the random matrices, and it overcomes scaling limitations observed in other algorithms by operating on each cell of the new matrix in parallel (Cavner *et al*., 2012). The used algorithm holds marginal values constant for both species totals and site totals to produce results that are more closely related to the observed PAM, as opposed to only fixing one or none of the marginal values (Gotelli, 2000). We compared the observed minimum and maximum covariance between sites with the distribution of the simulated covariance to estimate their *p* values. Observed results between observed and randomly expected predictions showed statistical differences from values obtained. Overall, we observed that randomization algorithm leaves PAM dimensions and fill constant, which have covariance values lower than random in all cases (*p* < 0.001).