

A bit of Theory

The CREST method (Climate REconstruction SofTare - [1]) is a Bayesian approach that combines presence-only occurrence data with modern climatologies to estimate the conditional responses of a given set of taxa to a variable of interest. the combination of these responses can be use to estimate past climate probabilities. To illustrate the conceptual background of CREST, we will consider fossil pollen data, as these are great, ubiquitous climate proxies. One specific characteristics of pollen data is their limited taxonomical resolution. Usualu, pollen cannot be identified at the species level, but at a higher level (sub-genus to family level), which complexifies the modelling of the pollen-climate responses.

Taking the form of probability density functions (*pdfs*), these taxon-climate responses are estimated in one or two steps based on the nature of the proxy being studied. In simple cases, where fossils can be identified at species level (*e.g.* foraminifers, plant macrofossils), the *pdfs* are defined by unimodal and parametric functions (*e.g.* normal or log-normal distributions depending of the nature of the studied variable, see [1-2] for a more detailed discussion). The parameters (*e.g.* a mean and a standard deviation in the case of a normal or log-normal distribution) describing these distributions are estimated from the ensemble of climate values corresponding to the presence records (**Fig. 1**), each being weighted as an inverse function of its abundance in the study area. This correction removes the influence of the heterogeneously distributed modern climate space and ensures that the optimum exhibited by the *pdf* reflects the true climatic preference of the species, rather than the modern abundance of a given climate value [3-4].

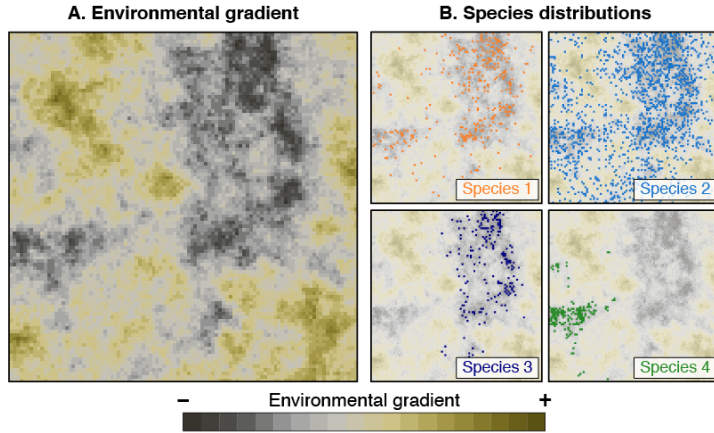


Figure 1: **Fig. 1**: (left) Climate variable to reconstruct (*e.g.* mean annual temperature). (Right) Four distinct plant taxa living in that region and having a preference for the darker climates (*e.g.* a preference for colder climates). These four species produce undistinguishable pollen grains and, therefore, define a pollen type. This example is based on pseudo-data.