**Dirichlet-multinomial Empirical Bayesian model of OTU distribution**

Observed data (observed OTU’s count):

Where *i* and *j* correspond to *i*-th sample and *j*-th OTU

= vector *i* of observed j OTU counts

= a probability vector that defines expected number of each OTU abundance in *i*-th vector

= expected *j*-th OTU abundance in *i*-th vector

= over dispersion parameter drawn from the NB distribution with empirically estimated and hyperparameters

= a probability that defines

= a parameter that includes effects of climate (*CL*), genetic distance (*D*) and a random effect (*e*) distributed according to a Gaussian distribution with the corresponding hyperparameters

Full model up to a multiplicative constant: