1. Generate hazard-consistent ground motion scenarios for the intensity measures of interest, e.g. taking into account spatial ()and between event () correlations. Here each field is a realization of the intensity measure for the entire portfolio. This are computed in the platform as:

where are samples of a multivariate standard normal random variable due to ground motion. For a single site, such as CU, and the quantities are scalars. Hazard-consistent scenarios imply that the seismic hazard curve at each site can be recovered from the scenarios, i.e.

where is the rate of occurrence of each ground motion scenario such that , and is the Heaviside function. The number of scenarios required to approximate the seismic hazard curve can be very large. Here is where we can apply variance reduction techniques such as k-Means clustering.

1. Generate realizations of the losses for each building category. In the following expression, is the mean value of loss for a building in the category, is the uncertainty about the mean (it could be a single number for all the elements in the portfolio), and are samples of a multivariate standard normal random variable due to structural system. (Miguel, do we know of any cross-correlation for losses? G, there is no formal study, it has been assumed through simulations that there is a correlation coefficient between the losses of 0.2-0.3 e.g., 0.2 was assumed in the barrel article Jaimes, Candia & Favier 2018 :), if not, the matrices are diagonal)
2. Compute the loss rate for each loss category as
3. Compute total losses as