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Two strategies to better constrain physics-based rupture scenarios and their uncertainties

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Physics-based rupture modelling needs some estimates of the physical parameters controlling the rupture mechanics, such as stresses, friction properties, fault geometries, as well as their variability in space. Given the lack of knowledge and direct way to infer the physical parameters controlling the rupture, these parameters come with uncertainties. To go further toward physics-based source models, we need to find strategies both for improving constraints on the input parameters, especially their variability along the fault plane, and for taking into account the uncertainties in the models.
Here I present two interesting ways to improve our prediction capabilities.
First, to reduce the uncertainties on the models, new strategies need to be tested for a better estimation of the input friction and stress parameters. In this framework, I will show examples of using interseismic coupling maps (Japan, Chile) as a proxy for the variability of stress drop along the fault plane. This strategy is an efficient way to introduce independent external constraint on the modelling, reducing the total uncertainty of the scenarios.
Second, in order to quantify the final uncertainty of the results, we need to choose an appropriate way to handle of the variability of the input parameters. One way is to use logic trees. In this way the final results (rupture scenarios or ground motions) will come with an estimation of the uncertainty. I will illustrate this point with an application to the segmentation of rupture in the Corinth rift and magnitude probabilistic estimation.