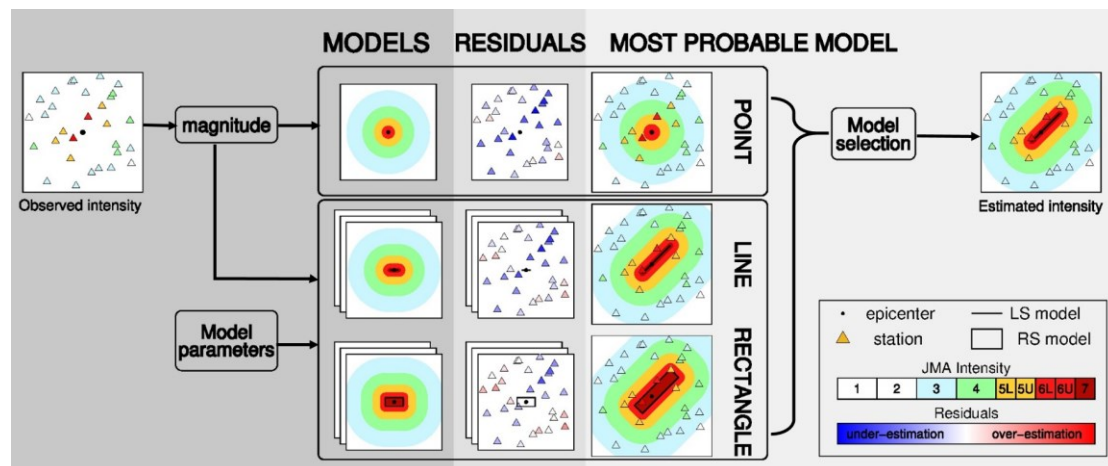# XYtracker: a new approach to estimate fault rupture extent in real-time for large earthquakes

Xiao Ying (IEM, CEA) and Masumi Yamada (DPRI, Kyoto University)

We present a methodology for estimating fault geometry and utilizing the distance to the fault for the shaking estimation to promote the accuracy of real-time shaking estimates for major earthquakes. Most of the earthquake early warning system currently estimates the seismic intensity with the ground-motion prediction equations (GMPE) as a function of the hypocenter distance. Using the fault distance computed from a good source model, however, can improve the accuracy of the shaking intensity estimation for a major earthquake.

For large earthquakes, high-frequency ground motions tend to saturate over the magnitude range and have a strong relationship with fault distance. As a result, this work can achieve the fault extent by applying seismic intensity and GMPE. We considered three types of fault models: point-source model, line-source model, and rectangle-source model. We found the most probable model parameters for each model by minimizing the residual sum of squares between the observed and estimated seismic intensities. The Akaike Information Criterion selected the most probable model among them.

The new method for estimating the fault geometry can obtain the ongoing rupture length and direction from the strong motion data. The model selection method with the AIC can determine whether the finite-source model is suitable to represent the shaking distribution. Results revealed that this innovative approach performed perfectly in estimating the fault dimension. The method can promote the accuracy of the seismic intensity estimation for future large earthquakes, including subduction earthquakes.

The flow of XYtracker. The process comprises three steps: (1) obtaining source model parameters from the observed seismic intensity, (2)computing the residual between the observed and estimated intensities, and (3) selecting the most probable model based on AIC

[Reference]Xiao, Ying and Masumi Yamada (2022), Xytracker: A New Approach to Estimate Fault Rupture Extent in Real Time for Large Earthquakes. Earth, Planets and Space 74, no.1, https://dx.doi.org/10.1186/s40623-022-01650-1.