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Effects of Listricity on Probabilistic Seismic Hazard Assessment

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In this study we investigate and quantify the effects of listricity on seismic hazard . Listric faults are defined as curved faults in which dip decreases with depth, resulting in a concave upwards shape. Previous works already show that breaking the symmetry of faults affects rupture dynamics and nearfield ground motions. Here we focus on the effects on the seismic hazard caused by breaking fault planarity.

We model the seismic wavefield using a generalised 3D finitedifference method and quantify the effects of initial dip, slip distribution and fault listricity on the ground motions. A listric profile is built by applying a specific shape function, and an ensemble of kinematic source models is generated by varying the average dip and slip distributions corresponding to a Mw 6.8 earthquake. This ensemble is combined with different hypocentre locations and rupture velocities. Then numerical simulations with a maximum frequency of 1Hz are performed including both the listric and planarfault geometries. Finally we compare peak ground velocities obtained for the different scenarios and quantify the differences.

Preliminary results show an overall inverse correlation between listricity and average peak ground velocities: as the fault becomes more listric, the average peak ground velocities over the entire simulation domain are reduced. However, we discover that ratios of peak ground velocity of the planar and listric fault have striking differences when considering the hanging wall and foot wall individually: relative to the planar case, with increasing listricity peak ground velocities reduce on the footwall and increase on the hanging wall.

With the knowledge acquired, a ground motion correction factor can be estimated and included in ground motion predictions equations when the fault is expected to be listric (e.g., from geological information) and seismic hazard maps should be adjusted to take into account listricity induced foot/hanging wall effects.