Introduction of seismic source directivity on hazard map

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The seismic hazard maps are mainly influenced by the uncertainty associated to the ground motion predictive equation (GMPE). This uncertainty represents the unexplained part of the ground motion and it is mostly related to the choice of the model's variables. In fact the representation of the ground motion through the GMPEs is simple compared to the complexity of the physical process involved: if only the magnitude and distance are taken into account, GMPEs predicts isoseismals curves that are expected to be isotropic around the hypocenter or along the fault. Instead, the presence of a fault plane across which a process of failure in shear develops makes this general formulation reliable only on average. In fact this failure is responsible of an asymmetry in the seismic radiation known, since Ben-Menhaem (PhD1961), as *directivity effect*. While the general knowledge of the earthquakes is treated explicitly in the empirical prediction, specific trends like the directivity effects are hidden in the uncertainty sigma. A way to reduce the sigma is therefore to refine the seismic seismic source description inside the GMPEs (e.g. NGA project, Power et al, Earthquake Spectra, 2008).
In this framework we propose a strategy to introduce the directivity in the GMPEs and to study its effect on uncertainties and on hazard maps. For this purpose, we have used two different directivity models acting on the GMPE as corrective factors: one proposed by Somerville et al. (Seis.Res.Lett.1997) and the other one proposed by Spudich and Chiou (Earthquake Spectra 2008).The first factor depends on geometrical parameters and comes from theoretical deduction. The second one includes many source parameters and it is a hybrid factor, which functional formulation is deduced from the theory, calibrated on synthetic simulations and scaled on data.
The classic hazard equation is then adapted in order to increase the number of source parameters (i.e. adding one integral over the parametric space for each new variable involved) and taking into account the corrective factors for directivity (Spagnuolo, PhD2010). We present the comparisons of hazard maps depending on the directivity factor and on the probability density functions of the fault strike and of the rupture "laterality".