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Mixed Effect of Directivity and Directionality for Near Fault Pulse Type Ground Motions

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Ground motions are described with one vertical and two horizontal components. But the intensity of horizontal component can change for different orientations due to polarization of ground motion which is referred to as directionality. On the other hand directivity is the effect of source to site wave propagation in near fault earthquakes. Directivity forms a pulse in the beginning of the velocity time history which is mostly seen in fault normal direction. This kind of records show higher amplitudes in medium to high period ranges of acceleration spectrum which makes them different from normal earthquake ground motions. When different Ground Motion Prediction Equations (GMPEs) are used in logic tree of Probabilistic Seismic Hazard Analysis (PSHA), the horizontal component definitions of these GMPEs should be consistent with each other. In order to prevent inconsistency between ground-motion predictor parameters some researchers have proposed models to convert different horizontal component of motion to each other. While some of these models have tried to catch maximum rotated component of ground motions the other models have been proposed to incorporate the effect of directivity for near fault pulse type records.

In this study we have proposed a model for the calculation of maximum rotated component of ground motions with directivity effect (RotD100directivity). This parameter has been calculated from the normalization of maximum rotated component of near fault pulse type and non-pulse type ground motions. This factor is used together with maximum rotated component (RotD100) model of Shahi and Baker (2013) and Chiou and Spudich (2013) directivity models (NGA west 2) to calculate the maximum rotated component of pulse type records with directivity effect.

Furthermore, Shahi and Baker (2011) and Chiou and Spudich (2013) directivity models has been used in order to study the effect of seismological parameters on the amount of amplification of response spectrum with a full probabilistic seismic hazard frame work.