The simulation of the stochastic slip distribution of earthquake rupture

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Abstract

Reasonable ground motion input is very important for studies of earthquake hazard analysis and the seismic design of engineering structures in high seismic intensity area. Due to the characteristics of the ground motion are strongly affected by the stochastic slip distribution of earthquake rupture, based on the mechanism of seismological physics, we take Cascadia subduction zone as an examples , subdivide the fault into many subfaults and prescribe a covariance matrix relating slip on one subfault to slip on any other subfault. Choose three commonly used correlation functions, the Gaussian, exponential and Von Karman correlation function, to control the spatial statistics of slip distribution and define the covariance matrix. Then, the eigenvalues and eigenvectors of the covariance matrix are used to define the Karhunen-Loève expansion for generating stochastic slip distributions of earthquake rupture, and compare with the spectral representation of stochastic slip distribution based on Fourier series approach. The finial result shows that the Von Karmon correlation function can best describe the slip distribution and is a good choice for strong ground motion simulation.

Keywords: **seismic source; stochastic slip distribution; correlation functions; Karhunen-Loève expansion**