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Study on the Impact of Focal Mechanism on Long-period Ground Motions

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The study of long-period ground motions is significant to seismic design of large-scale engineering structures such as high-rise buildings and long-span bridges. In 1997 a strong earthquake swarm which contained 7 earthquakes with magnitude greater than 6 occurred in Jiashi, Xinjiang, China. The digital broad-band seismic records in Wushi seismic station were obtained for these earthquakes. The digital broad-band seismic records are suitable for studying long-period ground motions[1]. Because these earthquakes repeatedly occurred in the same place and were recorded in the same seismic station, the propagation path and site effects can be eliminated when comparing the records. The differences between the records only reflect the impact of earthquake sources. Fortunately the focal mechanisms of the earthquakes contain strike-slip, normal and reverse faults, so it gives us a very good chance to study the impact of earthquake magnitude and focal mechanism on long-period ground motions. After correction the long-period response spectrum is calculated for all the records. The long-period response spectra were compared versus earthquake magnitude and focal mechanism, respectively. The results show that: (1) Earthquake magnitude has strong effects on the long-period ground motions. Larger earthquake has more long-period ground motion contents. (2) Compared with the strike-slip earthquakes, the oblique-faulting earthquakes have more long-period contents in vertical component. (3) The long-period horizontal acceleration response spectra of strike-slip earthquakes are higher than that of the normal-faulting earthquakes, but it is difficult to figure out whether it is due to the focal mechanism or the lower stress drop of normal-faulting earthquakes.

References

[1] Hu, Y. X. and Yu. Y. X. *Proceedings of 12th World Conference on Earthquake Engineering*, Paper No.0680(2000).