# Simulation of long-period ground motions in the Kathmandu basin during the 2015 Gorkha, Nepal, earthquake

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The 2015 Gorkha earthquake ($M_w$ 7.9) occurred in the central Nepal at 06:56 on 25 April 2015 (UTC), and caused extensive damage to the Nepal society. During the 2015 Gorkha earthquake, strong ground motions with predominant components at 4–5 s period were observed in the Kathmandu basin (e.g. Galetzka et al. 2015; Takai et al. 2016). The waveform observations inside and outside the Kathmandu basin indicated that the characteristic long-period ground motions were caused by both effects of the source and Kathmandu basin. In order to investigate how well the long-period ground motions can be reproduced by available source and structure models, we carried out the waveform simulation in long period (> 4 s) at KATNP site located in the Kathmandu basin using the source model obtained by the joint source inversion and the estimated 1D velocity structure model for the Kathmandu basin.

The source process of the 2015 Gorkha earthquake was estimated by the fully Bayesian multiple-time-window source inversion (Kubo et al. 2016) with jointly using near-field waveforms, teleseismic waveforms, and geodetic data. The estimated seismic moment and maximum slip are $7.5\times10^{20}$ Nm ($M_w$ 7.9) and 7.3 m, respectively. The total source duration is approximately 50 s. The derived source model has a unilateral rupture towards east and a large slip area north of Kathmandu with the maximum slip.

The 1D deep subsurface velocity structure beneath KATNP was constructed by a trial-and-error process to reproduce the peak period on the long-period side of the horizontal-to-vertical spectral ratios of coda waves from eight aftershock recordings. The available geological and geophysical information were also utilized in this process. In this basin structure model, the thickness of low-velocity (Vs < 500 m/s) layers is approximately 460 m.

Using the derived source model of the 2015 Gorkha earthquake and the structure model of the Kathmandu basin, we carried out the simulation of the long-period ground motions during the 2015 Gorkha earthquake. The simulation demonstrated that the major features of the observed waveforms can be reproduced by our source and basin structure models.

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Keywords: Long-period ground motions, The 2015 Gorkha earthquake, The Kathmandu basin, Waveform simulation

 