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Large-scale shaking table test study of acceleration dynamic responses characteristics of slopes

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Based on prototype slopes in disaster areas of'May 12'Wenchuan earthquake, two types of horizontally layered model slopes including hardness-upward and softness-upward are designed to perform the large-scale shaking table test with the geometric scale of 1:100. Under the condition of similitude law, the seismic responses of model slopes are investigated with different input wave kinds, frequencies, excitation directions and amplitudes. Taking the situations of inputting acceleration amplitude of 0.3g as the typical example, the co-rotating acceleration dynamic responses of model slope with different lithology associations are analyzed under the single crude seismic load. The results show that the responses present obvious non-linearity along vertical and horizontal directions; and the elevation has amplification effect on seismic waves totally. Under the horizontal seismic load, the dynamic responses of slope appears mainly at the middle-upper part. However, with the equal input seismic load, the largest amplification of vertical acceleration is only one half of that of the horizontal acceleration; and the dynamic responses of slope appears mainly at the middle-lower part. The effects of different lithology associations on the acceleration response rules also vary with the different excitation directions. That is, under the horizontal seismic load, the hardness-upward slope demonstrates larger amplification effect of acceleration than the softness-upward slope basically; and under the vertical load, the result is opposite. Finally, by comparison of acceleration Fourier spectra in different elevations on the slope surface, the hardness-upward slope has obvious selectivity of predominant frequencies while the waves are propagating from the bottom; and for both model slopes, the predominant frequencies in vertical excitation concentrate on higher frequency ranges than those in horizontal excitation.