Geophysical Research Abstracts
Vol. 16, EGU2014-10999-2, 2014
EGU General Assembly 2014

Transient surface-wave responses of porous media under moving surface impulses

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Three-dimensional transient responses of porous media under moving surface impulses of finite frequency components are theoretically studied. We discuss three free-surface stiffness conditions, such as fully permeable - 'open pore', fully impermeable - 'closed pore', and partially permeable boundaries, that are not explicitly discussed before. The transient responses of the solid vertical displacement and the pore fluid pressure triggered by the moving impulses on the surface are particularly investigated in different typical surface stiffness, moving impulse velocities, material permeability and impulse peak frequencies. It is concluded that the R1 surface wave carries the strongest energy as that for stationary source configurations. Moreover, it is more sensitive to surface stiffness condition than body waves represented in the responses of the corresponding wave forms of obvious different amplitudes and arrival time. Furthermore, the apparent velocity of the moving impulse pointing toward the fixed receiver may cause 'blue shift' in frequency. The higher velocity triggers more obvious frequency shift. For the moving impulse of low peak frequency, this shift becomes much serious. The lateral velocity of the moving impulse to the receiver may also twist the received wave forms, especially for the impulse of low peak frequency. Gratitude is expressed for financial support of the National Basic Research Program of China ('973-Project', Grant No. 2013CB733303), National Natural Science Foundation of China (Grant No. 41304077), Postdoctoral Science Foundation of China (Grant No. 2013M531744), and Key Laboratory of Geospace Environment and Geodesy (Grant No. 12-02-03).