圆弧状多层沉积谷地在平面SV波入射下的动力响应

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Dynamic response of alluvial valley containing multiple circular-arc layers incident by plane SV waves

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摘要 利用波函数的Fourier-Bessel级数展开法，推导出了含任意多个圆弧状沉积层的谷地在平面SV波入射下稳态动力响应的解析解，并分析了该级数形式的解析解随着截断项数的收敛问题.其结果表明，该级数能够在一个非常宽的频带范围内收敛；通过在简化条件下与现有其他解析解的比较，验证了该解析解的正确性；并利用该解析解，以稳态地面运动的位移幅值和相位差为基本参数，在一个较宽的频带范围内讨论了谷地中沉积介质的成层性对地面运动的影响，其结果表明对于多层谷地而言，当入射波频率较高时，散射波之间的干涉显著并且出现了能量聚焦现象.

关键词 圆弧状多层沉积谷地，平面SV波，散射，解析

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Abstract： Firstly, by the method of Fourier-Bessel series expansion of wave functions, deducted is the analytical solution to the stationary dynamic response of alluvial valley containing arbitrary number of circular-arc layers, which is excited by the incident plane SV wave. And the convergence of this series-form analytical solution with the truncation number of terms is analyzed, which demonstrates that the proposed series solution can converge in a very broad frequency band. Secondly, the comparison with the other existing analytical solution under the simplified conditions, validates the correctness of the proposed solution. At last, using the proposed analytical solution and introducing the amplitude and the phase difference of the stationary ground motion displacement as the basic parameters, the influence, which the layering of the deposits in the valley imposes on the ground motion, is discussed in a broad frequency band, which shows that as to the multi-layered valley, when the frequency of incident wave is high, the interference among different scattering waves is distinct, and the phenomenon of energy focus appears accordingly.

Keywords Alluvial valley containing multiple circular-arc layers, Plane SV wave, Scattering, Analytical solution

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