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圆弧状多层沉积谷地在Rayleigh波入射下动力响应的解析解

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Analytical solution to dynamic response of circular-arc-shaped multi-layered valley due to incident Rayleigh wave

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摘要

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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Rayleigh波入射下二维稳态动力响应的解析解, 分析了该级数形式解析解随截断项数的收敛问题, 讨论了在获取该解析解的过程中, 用于计算Rayleigh波自由场的有限项数的项数和用于模拟水平地表的大圆弧的半径对解的影响. 研究表明, 该解析解能够在非常宽的频带内收敛. 最后, 利用该解析解, 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, 包括沉积层的层数、软弱夹层的存在及其厚度等因素对地面运动的影响.

关键词: 沉积谷地 成层性 散射 解析解 Rayleigh波

Abstract: By the method of Fourier-Bessel series expansion of wave functions, the paper presents an analytical solution to the two-dimension stationary dynamic response of alluvial valley containing arbitrary number of circular-arc-shaped layers, excited by incident Rayleigh waves. And not only the convergence of the proposed series-form analytical solution with the truncation number of series terms is analyzed, but also the influence of the number of the terms of the finite Fourier series which determine the free-field displacement and stress on the incident Rayleigh wave, as well as that of the radius of the big arc which simulates approximately the flat space surface, on the solution is discussed. The results show that the proposed analytical solution can converge in a very broad frequency band. At last, by the proposed solution, the layering effects of the deposit in valley, such as the number of alluvial layers, the existence of soft interlayer and its thickness, etc., on the motion are investigated in a broad frequency band.

Keywords: Alluvial valley Layering Scattering Analytical solution Rayleigh wave

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