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地震波双向照明的概念及计算方法

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The concept and calculation method of bi-directional seismic illumination

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摘要 根据WRW模型理论,从地震波传播的物理过程给出了双向照明的具体概念,基于该概念提出了计算地震波双向照明强度的基本思路(称为DUC双向照明方法).为了有效提高DUC双向照明方法的计算效率,又提出了DUC-DC双向照明方法,并将提出的上述方法与传统的双向照明计算方法从计算精度和计算效率等方面进行了对比.试验结果表明,本文提出的双程波DUC方法得到的双向照明结果与理论照明结果完全一致,从而证明了本文提出的双向照明概念的正确性.而单程波DUC-DC计算方法大幅度提高了双向照明强度的计算效率.本文提出的双向照明计算方法不仅能考虑到检波器接收孔径问题,还能将地表不同位置检波器处接收能量不同这一因素纳入考虑范围.

关键词: 地震波双向照明 观测系统设计 DUC双向照明方法 DUC-DC双向照明方法

Abstract: According to the WRW theory, this paper presents a definition of bi-directional seismic illumination on the basis of the seismic wave propagation process. Based on the definition, a new quantitative bi-directional seismic illumination method, which is called "DUC bi-directional seismic illumination" in this paper, is proposed. In order to improve the computational efficiency of this new method, DUC-DC bi-directional seismic illumination method is proposed. In the numerical experiments, the computational accuracy and efficiency of these two new methods are discussed and compared with the traditional bi-directional seismic illumination method. The result shows that the two-way wave-equation-based DUC bi-directional illumination result is very close to the theoretical bi-directional illumination result, so the correction of the DUC bi-directional illumination method is verified. Furthermore, the DUC-DC bi-directional illumination method is also turned out to be a method with a higher computational efficiency. These new methods can take into account not only the geophones' geometric positions but also the different energy from different receivers during the calculation of bi-directional seismic illumination.

Keywords: Bi-directional seismic illumination Seismic survey design DUC bi-directional seismic illumination DUC-DC bi-directional seismic illumination

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