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饱水和排水过程中岩石电阻率各向异性特征的电阻率成像法研究

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摘要 从电阻率的角度研究岩石裂隙介质的各向异性特征是一种方便而有效的方法，但多限于空间单个点上的测量数据分析.通过在砂岩岩样上的饱水与排水实验以及同步进行的高密度电阻率成像监测，探讨了应用高密度电阻率成像法获得图像研究岩石各向异性特征的可能性，分析了饱水与排水过程中岩石电阻率在不同方向上的响应特性.结果表明，电阻率成像法在分析岩石裂隙介质的各向异性方面具有多方向成像和动态监测的优点，可以通过对不同方向上获得的电阻率图像的分析，提取出岩石沉积结构的空间分布模式，清晰地反映出岩石在饱水和排水过程中电阻率变化空间分布模式的各向异性特征.

关键词 岩石电阻率 各向异性特征 电阻率成像法 饱水过程 排水过程

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The anisotropic properties of rock resistivity during saturation and desaturation processes revealed by electrical resistivity tomography

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Abstract With electrical resistivity parameter, it is convenient and effective to analyze the anisotropic properties of fractured rocks. However, only resistivity data obtained at individual points were used for this analysis now. Based on water saturation and desaturation experiments made on a sandstone block and simultaneous monitoring with high density electrical resistivity tomography (ERT), in this paper we investigated the possibility of using resistivity images from the ERT to study the anisotropic properties of the rock, and analyzed the responses of rock resistivity measured at different directions to the water saturation and desaturation processes. The results indicate that as the ERT has a advantage of being able to multi-directional imaging and monitor, on the basis of a analysis of resistivity images obtained at different directions, it is possible to characterize the spatial distribution patterns of the rock structure, and illustrate the anisotropic properties of the spatial distribution patterns in the rock resistivity changes during water saturation and desaturation processes.

Key words Rock resistivity; Anisotropic properties; Electrical resistivity tomography;Saturation process; Desaturation process

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