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基于背景噪声研究云南地区面波速度非均匀性和方位各向异性

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Azimuth anisotropy and velocity heterogeneity of Yunnan area based on seismic ambient noise

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摘要

基于中国地震科学探测台阵项目一期在南北地震带南段架设的300多个地震台站，利用2011年10月至2012年9月的连续观测记录，采用基于背景噪声互相关函数的面波层析成像技术，研究了青藏高原东南缘的云南地区面波群速度和方位各向异性分布.结果显示，地壳的面波快波方向呈现近南北向，整体表现出围绕东喜马拉雅构造结顺时针旋转的趋势，和地表GPS速度场以及S波分裂的快波方位较为一致.小江断裂东西两侧的快波方位有一定差异.对反映深度大概在下地壳和上地幔顶部的长周期面波，快波方向从近南北向逐渐向北西向过渡，在菱形块体附近，26° N以南，快波方向和红河断裂的走向趋于一致；其他区域相比上地壳的快波方向也有较大变化，这种结果较为支持青藏高原东南缘的云南地区壳幔变形的解耦.在滇西南，澜沧江向东弧形展布区域，中下地壳快波方位呈现局部的圆周旋转趋势，结合该区地震分布规律和应力主轴方向，推测这种现象和块体挤压及旋转具有一定相关性.

关键词 云南地区, 方位各向异性, 噪声互相关函数, 面波层析成像

Abstract:

The azimuth anisotropy and velocity heterogeneity in Yuannan area is studied by surface wave tomography based on the ambient noise cross-correlation function, which is obtained using the one-year continuous noise data observed at over 300 stations set up under the project ChinArray Phase I. The results show that the direction of fast wave in the crust appears nearly NS, which is consistent with that of the fast S wave from regional earthquake S wave splitting and the velocity field from GPS observation, and exhibits a trend to rotate clockwise around Eastern Himalayan Syntaxis. The direction of the fast wave is different at the two sides along the Xiaojiang fault. For the long period surface waves, which reflect the properties of the lower crust and upper mantle, the direction of the fast wave gradually transfer to NW. At the south of 26° N, the direction of fast wave tends to the strike of the Red River fault. The change of the fast wave direction from NS in the upper crust to NW in the upper mantle implies that the deformation in the crust and mantle in Yunnan area might be decoupled. In the Southwest Yunnan, at the arc area where the Lancang River spreads eastward, the fast wave direction shows a trend of rotation clockwise locally, which might be correlated to the extrusion and rotation of the blocks by considering the earthquake distribution and the orientations of the mean principal stress axes.

Keywords Yunnan area, Azimuth anisotropy, Noise cross-correlation function, Surface wave tomography

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