EGU24-9088, updated on 06 Oct 2024
https://doi.org/10.5194/egusphere-egu24-9088
EGU General Assembly 2024

Seismogenic structure of the 2021 Ms6.4 Yangbi earthquake by seismic tomography based on the variation of information

Yuqi Huang[1], Haijiang Zhang[1], Jing Hu[2], ying liu[1], Ji Gao[1], and Max Moorkamp[3]
[1]School of Earth and Space Sciences, University of Science and Technology of China, Hefei, China
[2]School of Geology Engineering and Geomatics,Chang'an University, Xi'an, China
[3]Ludwig-Maximilians University of Munich, Munich, Germany

Seismic tomography is a useful tool to obtain the velocity structure of the Earth's interior. Compared with the Vp and Vs models, the Vp/Vs model is of great significance for studying the properties of subsurface structure, such as fluid saturation and porosity. However, due to different data quality and quantity for P- and S-wave, Vp and Vs models generally have different resolutions and uncertainties, leading to some artifacts in the Vp/Vs model. Tryggvason and Linde (2007) proposed to use the structural similarity in Vp and Vs models to better constrain the Vp/Vs model. However, the clustering relationship between Vp and Vp/Vs models is not optimized, which limits the further geological interpretations based on velocity models. In this study, we aim at developing a new seismic tomography method based on the variation of information for Vp and Vp/Vs models. This method follows joint inversion of magnetotelluric and gravity data based on the variation of information (Moorkamp, 2022), which can improve the clustering relationship between electrical resistivity and density.

The 2021 Ms6.4 Yangbi earthquake is located at the intersection of the Red river fault and the nearly north-south trending Lijiang-Dali fault system on the southwestern boundary of the Sichuan-Yunnan block. This earthquake has the classic characteristic of a "foreshock-mainshock-aftershock" sequence. In this study, we have developed a new seismic tomography method based on the variation of information to couple the Vp/Vs model with the Vp model to obtain more reliable Vp, Vs, and Vp/Vs models in the source region of the Yangbi earthquake. Our results show that the foreshocks occur in structures with low Vp, high Vs and low Vp/Vs, while the main shock occurs in the area with high Vp, high Vs and low Vp/Vs. Based on the cross-plot analysis and petrophysical experimental data, we suggest that long-term stress accumulation causes shearing in areas with high quartz content at a depth of 10km.