Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

SCG57-P31 会場:コンベンションホール 時間:5 月 27 日 18:15-19:30

New Madrid 地震帯の地殻と上部マントル構造
Crust and upper mantle structure of the New Madrid Seismic Zone: Insight into intraplate earthquakes

Chen Chuanxu[1] ; 趙 大鵬 [1*] ; Wu Shiguo[1]
CHEN, Chuanxu[1] ; ZHAO, Dapeng[1*] ; WU, Shiguo[1]

[1] 東北大学大学院理学研究科
[1]Tohoku University, Department of Geophysics

The New Madrid Seismic Zone (NMSZ) is seismically the most active region in the Central and Eastern United States and an ideal area to study intraplate earthquakes. A sequence of at least three large earthquakes (M >7.0) occurred here in 1811-1812, and palaeo-seismic records show evidence of large earthquakes about 500 years apart in the past 2000 years. The distribution of local earthquakes recorded since 1974 delineates three linear faults in the NMSZ: (1) the NE-trending Cottonwood Grove-Blytheville Arch fault along the central Reelfoot rift, (2) the NW-trending Reelfoot Fault, and (3) the NNE-trending New Madrid North Fault. The activation of these mid-continental faults and their controls on duration of the seismic activity remain poorly understood. One of the fundamental questions is: what makes the NMSZ different from the surrounding intraplate areas in North America, especially the areas within the same geologic settings?

We determined a 3-D P-wave velocity model of the crust and upper mantle down to 400 km depth to investigate structural heterogeneity and its influences on the generation of intraplate earthquakes in the NMSZ. We used 4871 high-quality arrival times from 187 local earthquakes and 30,846 precise travel-time residuals from 1041 teleseismic events recorded by the Earth-Scope/USArray Transportable Array. Our results show that, beneath the Reelfoot rift, a significant low-velocity (low-V) zone exists in the upper mantle down to 200 km depth, with a large volume of 200 km x 200 km x 150 km. The origin of the low-V zone may be related to the passage of the Bermuda hotspot and the stalled ancient Farallon slab materials foundering in the mantle transition zone. This low-V zone may have relatively low shear strength and act as a viscously weak zone embedded in the lithosphere, being apt to concentrate tectonic stress and transfer stress to the seismogenic faults in the upper crust, leading to the large intraplate earthquakes in the New Madrid Seismic Zone.

キーワード: New Madrid, 地震, 地殻, マントル, 速度構造
Keywords: New Madrid, earthquake, crust, mantle, velocity structure