Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

SSS31-03 会場:104 時間:5 月 22 日 16:00-16:15

2011年4月11日福島県浜通りの地震で井戸沢断層沿いで出現した地震断層で認められる条線と地殻応力場の関係
Relationship between crustal stress field and fault slickenlines due to the 2011 Iwaki earthquake

大坪 誠[1*], 重松 紀生[2], 高橋 美紀[3], 吾妻 崇[3], 今西 和俊[3], 安藤 亮輔[3]
OTSUBO, Makoto[1*], SHIGEMATSU, Norio[2], TAKAHASHI, Miki[3], AZUMA, Takashi[3], IMANISHI, Kazutoshi[3], ANDO, Ryosuke[3]

[1] 産業技術総合研究所 地質情報研究部門, [2] 文部科学省, [3] 産業技術総合研究所 活断層・地震研究センター
[1]Geological Survey of Japan/AIST, [2]Ministry of Education, Culture, Sports, Science and Technology, [3]Geological Survey of Japan/AIST

After the occurrence of the 2011 Mw 9.0 off the Pacific coast of Tohoku Earthquake (March 11, 2011), a Mw 6.8 (Mj 7.0) aftershock occurred on April 11, 2011 in Iwaki-city, Fukushima Prefecture, NE Honshu, Japan. The earthquake on April 11, 2011 (hereafter, 2011 Iwaki earthquake) occurred in temporal seismicity gaps and it was one of the major aftershocks after the 2011 Tohoku earthquake. To investigate the stress field before the 2011 Iwaki earthquake, we applied the multiple inverse method to the focal mechanisms during one month before the earthquake. Using 12 focal mechanisms during the one month, the multiple inverse method (Otsubo et al., 2008) revealed normal-faulting stress state with the NE-SW trending Sigma3-axis. The small angular misfits (7 degrees) between the slip direction predicted from the stress and that observed for fault plane of the 2011 Iwaki earthquake shows that the NW-SE trending extension is concordant with the slip motion of the 2011 Iwaki earthquake (Otsubo et al., 2011). We then succeeded measured co-seismic slip directions during the rupture of the 2011 Iwaki earthquake. Slickelines caused by the 2011 Iwaki earthquake are observed extensively over a wide range of the fault ruptures along the Itozawa Fault (Active Fault and Earthquake Research Center, 2011; Ishiyama et al., 2011; Otsubo et al., in press). Especially, the curved or cross-cutting fault slickenslins are observed at 8 localities along the Itozawa fault. The co-seismic slip have the curved slickenlines that the direction of fault motion during the rupture of the 2011 Iwaki earthquake shifted from a normal faulting with a left-lateral component to that with a right-lateral component. The angular misfits between the slip direction predicted from the NW-SE trending extensional stress and that predicted from the each component of the curved slickenlines on the fault scarps are ˜33 to 65 degrees and ˜2 to 17 degrees, respectively. Misfit changes show that the co-seismic slip direction shifted to normal faulting explained by the regional stress in the process of the faulting. These results suggest that co-seismic rupture processes near surface is a key to understand the gradual stress accumulations in the overlying plate associated with the huge trench type earthquake.

Acknowledgements:
Thanks are also due to the National Research Institute for Earth Science and Disaster Prevention (NIED) for making available the focal mechanism data in the study area.

Reference:
Active Fault and Earthquake Research Center (2011) http://riodb02.ibase.aist.go.jp/activefault/index.html
Ishiyama, T. et al. (2011) http://outreach.eri.u-tokyo.ac.jp/eqvolc/201103_tohoku/eng/#hamadori
Otsubo, M. et al. (2008) Determination of stresses from heterogeneous focal mechanism data: An adaptation of the multiple inverse method. Tectonophysics, 457, 150-160.
Otsubo, M. et al. (2011) Striations formed on the surface rupture due to the earthquake in the Fukushima prefecture on 11th of April, 2011, Japan. Abstract of the 2011 Geological Society of America Annual Meeting, 98-1.
Otsubo, M. et al. (in press) Slickenlines on fault scarps caused by an earthquake in Iwaki-city (Fukushima Prefecture, Japan) on 11th of April, 2011. Jour. Geol. Soc. Japan.

キーワード: 応力, 地震断層, 断層擦痕, 2011 年東北地方太平洋沖地震, 前弧, 東北日本
Keywords: Stress, Surface rupture, Fault striation, 2011 off the Pacific coast of Tohoku Earthquake, Fore arc, NE Japan