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Sediment fabric record in the trench axis formed during the 2011 Tohoku-oki earthquake

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The rupture of the 2011 Tohoku-oki earthquake propagated to the trench. Kodaira et al., (2012) revealed that the several ten meters scale displacement of the lower landward slope of Japan Trench occurred during the earthquake. Meantime an uplifted seafloor appeared in the trench axis, and the seismic reflection image beneath the trench floor reveals a thrust up structure. These observations are important keys to understand the slip of the 2011 Tohoku-oki earthquake. In order to detail the dynamics of the slip, surface sediments around the trench deposited before and after the earthquake were studied. Surface sediment cores were collected in the upheaval and un-upheaval areas from the trench axis, and the foot of the lower landward slope using piston and gravity cores. Cores from the trench axis consist mainly of coherent hemiplegic layers. On the other side, the sediment cores in the foot of the lower landward slope is characterized by mass-transport deposits and inclined layers of hemipelagite interbeded with silt/sand layers. Anisotropy of magnetic susceptibility (AMS), which is sensitive to soft sediment deformation, was studied to detect the sediment deformation. AMS from the trench axis shows fairly foliated magnetic fabric parallel to bedding planes, and parameters of AMS suggest that no lateral compression is recorded in the surface sediment. Instead, their sediment magnetic fabric in the trench sediment involve information of paleo-current of turbidites. On the other hand, AMS from the foot of lower landward slope is characterized by randomly orientated magnetic fabric indicating chaotic depositions, and inclined magnetic fabric indicating layer tilting downslope. Those fabric patterns in the slope suggest that the surface sequence were slid toward the trench. Preliminary interpretation on those data is that AMS reveal no compressional environment in the seafloor surface but sediment transporting information. If the upheaval structure in the trench axis formed during the earthquake, it should controlled the sedimentation pattern in the trench axis. It is expected that analysis of the sedimentary fabric in the area document such pattern. It will provide an unique information to understand the deformation during the slip in the trench axis. In this presentation, we will present detail properties of sedimentation on the basis of magnetic fabric.

Keywords: the 2011 Tohoku-oki earthquake, Japan Trench, turbidite, mass-transport deposits, Magnetic fabric