

ベクトル津波計による海底電磁気シグナルの観測

浜野 洋三 [1]; 杉岡 裕子 [2]; 多田 訓子 [2]; 藤 浩明 [3]; 南 拓人 [4]; 川嶋 一生 [5]

[1] JAMSTEC; [2] 海洋研究開発機構・IFREE; [3] 京都大学・大学院・理学・地磁気センター; [4] 京大・理・地物; [5] 京大・理・地惑

Observation of seafloor ElectroMagnetic(EM) signals by using Vector TsunaMeter

Yozo Hamano[1]; Hiroko Sugioka[2]; Noriko Tada[2]; Hiroaki Toh[3]; Takuto Minami[4]; Issei Kawashima[5]

[1] JAMSTEC; [2] IFREE, JAMSTEC; [3] DACGSM, Kyoto Univ.; [4] Geophysics, Kyoto Univ.; [5] SPEL, Kyoto Univ.

For the offshore measurements of tsunami EM signals and utilizing them for the tsunami warning at the coast, we developed a new type of ocean bottom tsunami meter called Vector TsunaMeter (VTM). The VTM observes three components of magnetic fields, two horizontal components of electric fields and tilts, and a differential bottom pressure for more than a year at sea floor up to 6000 m water depth. The VTM is designed to detect the temporal variations of sea level change, and particle motion associated with the tsunami passages. Arrival time, arrival direction, and phase velocities of tsunamis can also be calculated from the observed record.

The first seafloor observation of VTM was made during the last winter, in which the VTM was installed by KR12-18 cruise of R/V KAIREI, JAMSTEC on November 20, 2012 at 25 45.94N, 137 00.48E, Depth=4894m. And the VTM was safely recovered during KR13-02 cruise on February 9, 2013. The VTM continuously records the data sets of Bx, By, Bz, Ex, Ey, TiltX, TiltY, and bottom pressure P from Nov. 20, 2012 to the recovery time, i.e. Feb. 9, 2013. Three days before the recovery date, a Mw=8.0 earthquake occurred at the Solomon islands (10.738S, 165.138E) on 2013-02-06 01:12:27 UTC. The Solomon islands earthquake generated tsunamis, which hit near Solomon islands and causes damages to human beings and houses. Since the main energy of the tsunami propagates along the north-east to south-west direction from the epicenter of the earthquake, the tsunamis observed at Japanese coast were low. At the observational site of VTM, amplitude of the first wave is as small as 1 cm, but the VTM clearly records the variations of sea level change for more than several hours after the tsunami arrival around 2013-02-06 08:40 UTC.

In general, natural EM fields observed at seafloor are induced by sources of two main types: external ionosphere - magnetosphere current systems and internal-the dynamo effect (motional induction) between moving oceanic water and geomagnetic field. The external fields are generally used to obtain the electrical conductivity structure below seafloor, and the motionally induced internal fields are generated by various types of ocean waves such as tidal waves and tsunamis, and are used mainly for the oceanographic study. For our purpose of precisely detecting tsunami parameters from the seafloor EM signals recorded by VTM, understanding and possible removal of the external EM signals from the observed record is essential. By using the VTM data sets, we performed a newly developed analysis for the separation of the external and the internal EM fields, in which the simultaneous observed bottom pressure change plays a dominant role.