Data quality of ADCP of seafloor cabled observatories and reanalysis of mud flow associated with off Tokachi earthquake in 2003

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Acoustic Doppler Current Profiler (ADCP) is a sensor which enables to measure a vertical profile of water current velocities at a target water column by utilizing Doppler shift of transmitted acoustic signals back-scattered by suspended particles in sea water. They are attached to three cable-end stations of JAMSTEC's cabled seafloor observatories - off Hatsushima Island in Sagami Bay, off Kushiro-Tokachi in Hokkaido and off Mutoro Cape in Kochi. Since the intensity of scattered acoustic signal (echo intensity) depends on the quantity of the suspended particles as scatterers, not only water current measurement but also information about the quantity of the suspended particles in the target layer of the water column can be obtained with ADCP.

We have evaluated ADCP data quality of off Hatsushima Island observatory in situ by investigating association with deep sea environmental fluctuation obtained with other sensors of the observatory and with artificial disturbance caused by a Remotely Operated Vehicle (ROV) and a manned submersible.

As a result, association between ADCP data and environmental fluctuation such as echo intensity and the amount of suspended particles observed with video cameras and transmissometer were confirmed to some degree, although echo intensity decreased about 3.6 dB because of supplied electric power shortage when lights were on. Water current fluctuations caused by an ROV were recognized especially when it was descending and ascending above seafloor. Echo intensity increase associated with a submersible and ROV was also recognized at corresponding height when they were locating near the acoustic beam of ADCP.

Meanwhile, a strong current was observed with ADCP and a current meter of off Kushiro-Tokachi observatory when off Tokachi earthquake was occurred in 2003. However, data errors were occurred because of communication error at that time and only 6 hour data after the earthquake were obtained. We tried data restoration and about 24 hour data after the earthquake were recovered.

As the result of data recovery, some new features of the mud flow were recognized, such as a counter current at higher layer of the water column at about 12 hours after the earthquake and increase of echo intensity at about 100 m above seafloor which seems to be associated with a kind of turbulent flow caused by the bottom downward current and the upper counter current.