# Crustal resistivity Structure of Pacific Plate just before Subduction using Marine Controlled-Source Electromagnetic Surveys

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In the Japan Trench subduction zone, an old oceanic plate with an age of over 100 m.y., the Pacific plate, is subducting beneath the northeast Japan arc. However, recent heat flow surveys have revealed that the Pacific plate just before subduction may not be uniformly cold contrary to its old age. Localized high heat flow anomalies suggest that thermal structure of the Pacific plate in this area is not a typical one for old oceanic lithosphere, at least at shallow depths. To evaluate the factors controlling the temperature structure (e.g., fractures, fluid etc., together with heat sources), we conducted dense heat flow surveys and electromagnetic soundings on the seaward slope of the Japan Trench. In this presentation, we focus on the preliminary result obtained by the electromagnetic soundings.
The offshore experiment was done on July, 2014 at the KY14-10 cruise (R/V Kaiyo, JAMSTEC). The water depth in the target area (on the Pacific plate, far off Tohoku region, Japan) is about 5300-5600 m. We used a newly-developed controlled-source electromagnetic (CSEM) survey system for this research. It can be applied to exploration of seafloor resistivity, originally designed for AUV but available with a deep-tow system (DT). The power for transmitter is supplied from the DT. Three pressure cases (transmitter, controller and power converter) are mounted on the DT frame, and a long cable with length of 350m is towed behind the DT. Two source electrodes attached at the both end of cable are used for transmitting the artificial electric current into the seawater. The pulse width for artificial current was 2 seconds, and the amplitude of current was approximately 20-30 A. Two CSEM profiles were conducted in this cruise. The altitude of DT (and the source dipole) was about 50-100m with towing speed of about 1 knot or less.
The preliminary results indicate the low resistivity of shallow layers of the oceanic crust of Pacific plate. The amplitude of received electric field recorded by an OBEM was about 0.04 nV/(Am^2) when the source-receiver separation was about 1km. The received signal can be clearly recognized within the source-receiver separations of about 4km. All of the amplitude of electric field is smaller than the predicted ones from a numerical simulation, with assuming the uniform sub-seafloor structure with 1 Ohm-m (and a sea water layer of 0.3 Ohm-m). This implies that the shallow part of oceanic crust (possibly less than 1km) have very low resistivity than 1 Ohm-m. The anomalous feature may be related to the buried fractures in the top of oceanic crust, and could be related to the fluid circulations, a candidate of factors to explain the high heat flow.

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