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Preliminary results of new surface heat flow measurements in the northern East China Sea

Young-Gyun Kim

Seoul National University, School of Earth and Environmental Sciences, Seoul, Korea, Republic Of (kkky1@snu.ac.kr, +82-2-888-6733)

Conventional heat flow measurements using a marine heat probe have been rarely carried out in the shallow seas. This is generally because 1) strong bottom-water temperature variation (BTV) which significantly affects temperature distribution in the top few meters of sediments hides the background geothermal gradient generated by conductive heat from deep in Earth, and 2) coarse surficial lithology which prevents the heat probe from being penetrated enough into the sediments is prevalent. In the northern East China Sea, there is few surface heat flow data due to such harsh conditions. The sea experiences seasonal flux change of Kuroshio and Taiwan Warm currents and large amount of sediment discharge from Yangtze River. New heat flow measurements using a Ewing-type heat probe were made at 11 sites with water depths of 57-120 mbsl in December 2012. For the successive penetration of the probe, areas of the finer surficial lithology were carefully chosen as target sites based on core samples using a gravity corer as well as Chirp survey results. Also, length and weight of the heat probe were adjusted to 3 meter with 7 thermistors and $\sim$450 kg, respectively. As a result, the heat probe nearly vertically penetrated up to its full length into the sediments. Observed temperatures at depths are not fitted into a linear line, and show overall inversion with local maximum value at the middle depths. These are clear evidences of temperature disturbance by BTV. Due to lack of information, BTV is roughly approximated based on available bottom-water temperature data in the vicinity of the study area. After removal of BTV effects, the observed temperatures are nearly aligned into a line, indicating that conductive cooling is dominant heat transfer process in this region. Accordingly, the background geothermal gradient is estimated as 20-30 mK/m comparable with results from wells around the study area.