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Heat balance technique under the condition that the influence of solar radiation can be negligible

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The coefficient of geothermal flux is essential for the heat balance technique (Sekioka and Yuhara, 1974), which is one of the methods for measurement of heat discharge rate from geothermal fields, and is determined by micrometeorological data of a target area. In order to comprehend the temporal change of the micrometeorological conditions and the coefficient of geothermal flux, we have manufactured an automated continuous micrometeorological measurement system and measured micrometeorological data at some geothermal fields. And we have discussed about the coefficient of geothermal flux (Fujimitsu et al., 2009; Fujimitsu et al., 2010; Fujimitsu et al., 2011).

In the heat balance technique, a reference temperature is set on a ground surface where there is no geothermal anomaly, and the area that indicates higher ground surface temperature than the reference temperature is regarded as the geothermally anomalous area. However, the influence of solar radiation on the determination of the reference temperature is one of the main factors in accuracy of the estimated heat discharge rate by the heat balance technique. Therefore, we assumed the condition that the influence of solar radiation can be negligible, and conducted the observation experiments during the nights by using an artificial heating element as a heat source in order to improve the accuracy of the heat balance technique by a new analytical method.

For the new analytical method, we considered the heat balance at the ground surface under the condition of no solar radiation, adopted Richardson number for determination of the transfer velocity, and changed the determination procedure of the reciprocal of the Bowen ratio. As a result, the new analytical method estimated the heat discharge rates that are almost the same as the actual heat generation rates from the artificial heating element.

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