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Relationship between the coefficient of geothermal flux and ground surface temperature anomaly

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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 continual micrometeorological measurement system and measured micrometeorological data at the Kyu-Hachiman-Jigoku geothermal unit in the Unzen geothermal area in Nagasaki Prefecture, the Komatsu-Jigoku geothermal unit in Oita Prefecture, Aso Volcano in Kumamoto Prefecture and Hakozaki Campus in Fukuoka Prefecture. As a result, the values of the coefficient of geothermal flux showed turbulent changes in a wide range and in a short time (Fujimitsu et al., 2009).
And we also conducted a continual micrometeorological measurement with 1-minute interval synchronized with capturing the infrared images in the Komatsu-Jogoku geothermal unit in order to research a relationship between the coefficient of geothermal flux and the heat discharge rate obtained by the heat balance technique. The obtained values of the coefficient of geothermal flux are virtually governed by the transfer velocity and the reciprocal of the Bowen ratio. Therefore, the continual measurement of the micrometeorological conditions (atmospheric temperatures at 1 0, 50, 55, 150cm heights and a wind velocity at 100cm height) essential only for determination of the transfer velocity and the reciprocal of the Bowen ratio enables us to comprehend the temporal change of the coefficient of geothermal flux even if other micrometeorological conditions are measured only one time during the continual measurement. And when we define a high temperature anomaly of ground surface as the integrated value of the temperature difference between the reference point and each pixel of the infrared images for the pixels whose temperatures are greater than that of the reference point, the high temperature anomaly of the ground surface in the Komatsu-Jogoku geothermal unit shows a reverse-phase relationship to the coefficient of geothermal flux. It means that the relationship acts to stabilize the value of the heat discharge rate by the heat balance technique because the heat discharge rate is proportional to the product of the coefficient of geothermal flux and a high temperature anomaly of ground surface in the heat balance technique.
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