

## Repeated measurements of the Self-Potential at Akita-Yakeyama, Iwate and Kurikoma volcanoes

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We will report the SP (Self-Potential) anomalies at Akita-Yakeyama, Iwate, and Kurikomayama volcanoes. They are active volcanoes along the boundary of Akita and Iwate prefectures and their volcanic activities are relatively high recently.

SP measurements and SP anomalies at those volcanoes were reported by some researchers. We are still carrying out the SP measurements there repeatedly so as to monitor the activities of the volcanoes.

We conducted the SP measurements along the mountain trail from Tamagawa hot spring to Goshougake hot spring at Akita-Yakeyama in 2007 and 2017. At Mt. Iwate the SP measurements were conducted along the Yakebashiri trail up to the summit in 1999, 2004 and 2017. At northern part of Mt. Kurikoma we walked from the Nagorigahara moor, went through the summit and returned back anti-clockwise along the trail with SP electrodes in 2018. The result of the previous SP measurement in Kurikoma volcano can be found in the part of the Aizawa (2010) and we can investigate the time-lapse SP anomalies on these volcanoes.

We adopted the leap-frog measurement method with a 50 m cable, copper-copper sulfate electrodes, and a digital multi-meter (voltmeter). The latitude and longitude data were recorded by the handy GPS receiver (like as Garmin product). Although in the measurements of the leap-frog method might be easily piled up each error of the measured value at a site, a short cable can be easier handled than a longer cable over the length of a couple of kilometers using by the total-potential measurement method. The long and thin cable is sometimes cut apart by animals or human beings and unfortunately we have to return back to the cut point all the way to fix it.

On the compiling the SP data in different years we draw the SP curves along the cumulated distance. Since the cumulated distances of the SP measurements are sometimes up to several kilometers, the lengths of the cumulated distance are sometimes different by more than 100 m in the data of the respective years. We measure the SP on the same mountain trail but the end of the cable at each measurement is not always at the same point and the SP paths are slightly different in year to year on the measurements. This is the reason why the difference of the cumulated distance in different years. The problem might be happened also with the measurements of the total-potential method. To solve it, we set a model path with the function of the cumulated distance on the trail map in advance and the measured site were relocated (projected) onto the model path referred by GPS locations. After that we successfully and comfortably compare the SP data on the same trails.

At Akita-Yakeyama and Iwate volcanoes, we cannot find out the outstanding time variations of SP anomalies but the acquired SP data can be use the monitor the active volcanoes.

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Akita-Yakeyama volcano, Iwate volcano