

Permafrost distribution and its temporal variation on Mt. Fuji: A preliminary assessment

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We started a research project to understand permafrost on Mt. Fuji (3776 m asl.), to monitor its change and to evaluate the impact from changes of climate and volcanic activity on surrounding environments from the summer of 2008. In 2012, we continued to maintain the monitoring systems of ground temperatures and micrometeorological parameters in the summit area. Permafrost temperatures in the 10 m-deep borehole dug in 2010 were successfully monitored through the second year, while the data logger failed in the first winter by lightning. This is the first record of permafrost temperature through one year on Mt. Fuji, although the presence of permafrost had already been suggested until the 1970s.

Contrary to the assumption of the previous studies, permafrost absence was also confirmed in several other boreholes at the summit area. The highly permeable debris allows heat transportation by rain-water infiltration, which prevents the ground from being frozen throughout a year. Permafrost is supposed to exist only below an impermeable layer near the surface on Mt. Fuji. However, the distribution of impermeable layers is difficult to be evaluated because the degree of volcanic welding is largely heterogeneous. In contrast, the ground surface temperatures measured at 20 sites simply reflected air temperature and solar radiation. This indicates that the permafrost which only maintained at the locations less affected rain-water infiltration mainly responds long-term variation in air temperature. Thus, 0.7 deg.C warming from the 1970s to the 2000s recorded at the summit station has a potential to shift the lower boundary of the permafrost up to 100 m in elevation. In addition, according to the measured relationships between the surface temperatures and altitudes both on the north- and south-facing slopes, the monitored ground surface temperatures were spatially extrapolated for whole area of Mt. Fuji using a GIS software. For this calculation, the bench mark data were those of the permafrost monitoring site on the summit. The potential lower boundary of permafrost lies at 3050-3150 m asl. on the north-facing slope and at 3450-3600 m asl. on the south-facing.

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