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Development of a simple snow load gauge using plastic bottles

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Gravity observations with a superconducting gravimeter is performed at the underground site of the Kamioka Observatory, Institute for Cosmic Ray Research, The University of Tokyo. Since this station is located in an area where there is heavy snowfall in winter, the observation is subject to a significant effect of snow load. We developed a simple snow load gauge using plastic bottles with the aim of such hydrologic corrections. It is based on the principle of a snow pillow, which detects water equivalent of snowpack in terms of pressure changes of the anti-freeze coolant inside the sensing unit, and is much smaller and cheaper than the existing products thanks to the usage of plastic bottles. A laboratory test of artificially loading the instruments has revealed an almost linear relation between the load and the liquid pressure inside the bottles. The instrument was installed at the top of Mt. Ikenoyama, above the Kamioka underground site, in order to observe in situ snow load. Resultant time series of pressure changes turned out to be very similar to the observed gravity changes, suggesting that our instrument produced highly plausible recordings of snow load. We plan to make this observation at multiple sites in the mountain in order to measure 2-D distribution of snow load.

Keywords: snow load gauge, superconducting gravimeter, plastic bottle