Brief communication: Application of a muonic cosmic ray snow gagues to monitor the snow water equivalent on alpine glaciers - Supplement

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1 Lake experiment with muonic cosmic ray snow gauge

In an independent experiment, the muonic cosmic ray snow gauge was descended into a lake in the USA. The Cochiti lake is located in New Mexico at an elevation of 1702 m a.s.l. By descending the device into the lake, the overlying water depth is measured alongside the decreasing muon count number.

By dividing the initial count rate by the count rate with increasing water depth, the relative count rate is derived. This is fitted to the water depth, and results in two exponential equations with mainly different slopes. For shallow waters (< 1000 mm), the fit results in

$$SWE = -275.35 \cdot \ln \frac{\mu_i}{\mu_0} - 0.40. \tag{1}$$

For deeper water (> 1000 mm water depth), we fit

$$SWE = -811.76 \cdot \ln \frac{\mu_i}{\mu_0} - 239.79 \tag{2}$$

to relate the relative muon count rate to water depth.

Figure S1 shows the measured water depth as a function of relative count rates. Both fits agree well with the empirical data. The transition between the two fitted functions seems to occur between 1000 and 1500 mm water depth.

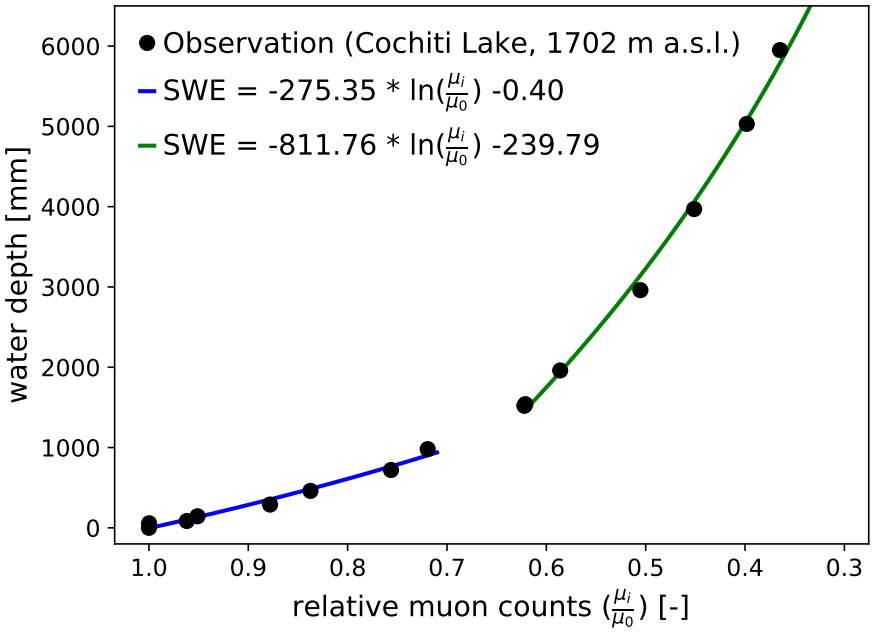

Figure S1. Empirical results from descending a μ-CRSG into a lake. Black dots depict the observations. The blue (green) curve show the fit for shallow (deep) water.