A measurement routine to determine $^{137}\text{Cs}$ activities at steep mountain slopes

Monika Schaub, Nadine Konz, Katrin Meusburger, and Christine Alewell
Institute of Environmental Geosciences, University of Basel, Bernoullistrasse 30, CH-4056 Basel, Switzerland

Caesium-137 ($^{137}\text{Cs}$) is a common tracer for soil erosion. So far, in-situ measurements in steep alpine environments have not often been done. Most studies have been carried out in arable lands and with Ge detectors. However, the NaI detector system is a good priced, easy to handle field instrument. A comparison of laboratory measurements with GeLi detector and in-situ measurements with NaI detector of $^{137}\text{Cs}$ gamma soil radiation has been done in an alpine catchment (Urseren Valley, Switzerland). The aim of this study was to calibrate the in-situ NaI detector system for application at steep alpine slopes. Replicate samples from an altitudinal transect through the Urseren Valley were measured ex situ in the laboratory with a GeLi detector, and compared to in situ NaI detector measurements. Ex situ soil samples showed a big variability in $^{137}\text{Cs}$ activities at a meter-scale. This large, small scale heterogeneity determined with the GeLi detector is smoothed out by uncollimated in-situ measurements with the NaI detector, which provide integrated estimates of $^{137}\text{Cs}$ within the field of view of each measurement ($3.1 \text{ m}^2$).

There was no dependency of $^{137}\text{Cs}$ on pH, clay content and carbon content. However, a close relationship was determined between $^{137}\text{Cs}$ and soil moisture. Thus, in-situ data must be corrected for soil moisture. Close correlation ($R^2 = 0.86$) was found for $^{137}\text{Cs}$ activities (in Bq kg$^{-1}$) estimated with both, in-situ (NaI detector) and laboratory (GeLi detector) methods which proves the validity of the in-situ measurements with the NaI detector system. This paper describes the calibration of the NaI detector system for field application under elevated $^{137}\text{Cs}$ activities originating from Chernobyl fallout.