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Soil-Borne Gamma Radiation and its Attenuation through Lime, Organic Material and Water

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Abstract

Gamma ray spectrometry has evolved as a promising tool to ease certain analyses and interpretations in soil science. It is a non-invasive method and it can be readily applied in the field e.g. for soil mapping with a handheld gamma ray device. Also air-borne gamma ray investigations get more and more important in soil mapping. Especially in the tropics where geological maps or soil data are sometimes still lacking, it has a lot of advantages like faster interpretation of soil changes *in situ* or determination of erosion and sedimentation locations. Even distinction between clay illuviation soils is possible in the field.

For further method development and elimination of interfering signals, their influences as well as their compensation have to be examined more in detail. Interfering signals are for instance cosmic radiation and different magnitudes of gamma ray attenuation through different contents of soil moisture or organic material. Attenuation through soil moisture often has inhibited to exactly measure gamma ray signals, particularly in humid or sub-humid tropical environments. Dependable coefficients for reliable results are still lacking. The present study shall fill this gap.

For attenuation coefficient development, several layer thicknesses of gamma ray attenuating materials were measured repeatedly over soil. Chosen attenuating materials were water, peat and lime as they are normally present in soils. The measurements were carried out in two locations in Baden-Württemberg. Afterwards, the attenuation coefficients were calculated. Mass attenuation coefficients for lime, water and organic material as well as for a mixture of these materials were identified.

Keywords: Attenuation coefficients, gamma ray spectrometry