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Drone-borne Gamma-Ray Spectrometry to Map Natural Radionuclide Concentrations and Detect Changes in Soil Moisture

Ronald Koomans[1], **R. Sarlemijn**[2], and **S. van der Veeke**[3]

[1]Medusa Explorations, [2]Department Earth Sciences, Faculty of Sciences, Vrije Universiteit Amsterdam, The Netherlands, [3]Medusa Radiometrics

Abstract

In regions where water scarcity is a pressing concern, soil moisture measurement is essential for optimized irrigation. This study explores the potential of drone-borne gamma-ray spectrometry as a cost-effective method for mapping soil moisture levels and detecting their temporal changes. Traditional methods for assessing soil moisture are often limited to point measurements, which may not accurately reflect the overall moisture content of larger agricultural fields. Addressing this challenge, our research, in collaboration with the International Atomic Energy Agency (IAEA), integrates airborne and stationary gamma-ray spectrometry for large-scale soil moisture mapping. The study compares data from six drone-borne gamma-ray spectrometry measurements, a quad measurement, readings from a stationary gamma Soil Moisture Sensor (gSMS) (Veeke et al., 2020), and a capacity soil moisture sensor. These measurements were conducted over three years in the same field near Onstwedde, Groningen (NL). This study aims to validate the spatial and temporal coherence of drone-borne gamma-ray spectrometry in mapping and monitoring soil moisture. Our results demonstrate a strong correlation between drone-borne gamma-ray spectrometry results, gSMS readings, and capacity soil moisture sensor. This confirms the effectiveness of drone-borne gamma-ray spectrometry in soil moisture assessment.

Keywords Gamma-ray spectrometry, soil moisture, drone, stationary, field experiment

References

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Correspondence to
Ronald Koomans
ronald@medusa-online.com