EGU22-818, updated on 12 Aug 2022
https://doi.org/10.5194/egusphere-egu22-818
EGU General Assembly 2022

Particle size fraction effects on MIR-DRIFTS: Improving the quantification of sub-basin spatial sediment provenance fingerprinting

Kazem Nosrati[1,2] and Peter Fiener[2]
[1]Department of Physical Geography , Faculty of Earth Sciences, Shahid Beheshti University, Tehran, Iran (k_nosrati@sbu.ac.ir)
[2]Water and Soil Resource Research, Institute of Geography, University Augsburg, Germany (peter.fiener@geo.uni-augsburg.de)

There is a growing interest to understand the sources of sediments in river channels as basis for potential mitigation aiming to reduce soil erosion and sediment delivery in larger catchments. Within the last decades, sediment fingerprinting has been established as a powerful tool to unravel the sources of sediments in larger catchments. However, most sediment fingerprinting techniques are based on time-consuming and costly chemical analysis of sediment samples from river channels and sub- catchments. Recent studies have shown the potential of diffuse reflectance infrared Fourier transform spectroscopy (DRIFTS) as a rapid, cost-effective, and nondestructive tracers for sediment fingerprinting. The aim of this study is to analyses the sensitivity of DRIFTS based sediment fingerprinting against particle size of sediment tracers and to determine the potential of using multi-size approaches. We used mid-infrared spectroscopy (MIRS; 4000-600 cm^{-1}) to analyze four size fractions (125-250, 63-125, 63-38, and <38 µm) of 54 sediment samples collected at three different sub-basins spatial sediment sources and 26 target sediment samples collected at the outlet of the main basin of the Andajrood drainage river basin in Iran. The spectral resolution was averaged over 32 cm^{-1} intervals to reduce the continues wavelength data to a defined number of spectral bands (n = 104) that is practicable and realistic for a statistical analysis of differences. A one-way ANOVA was used to evaluate the presence of significant contrasts between the content of individual MIRS spectra in the different size fractions. The results showed that MIRS spectra were present and distributed across all size fractions. The results of one-way ANOVA indicated that in sub-basin both, MIRS spectra form spatial sediment sources and target sediment samples, were significantly affected by the particle size fractions. Thus, this confirmed that it was appropriate to identify the dominant particle size fraction in the sediment samples and to confirm that MIRS spectra were present across that fraction rather than a sub-fraction.