Title:	A semi-quantitative method to estimate organic matter content of lake sediments using ITRAX micro-XRF core scanner data
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Abstract

Organic matter (OM) content of lake sediments may provide valuable information about the past depositional processes and environments. It is most commonly obtained by loss-on-ignition (LOI550) method, which is based on burning the OM in sediments at 550 °C for 4 hours. In addition to LOI550, OM content of sediments can be determined by total organic carbon (TOC) measurements by elemental analyzers. LOI550 is a simple and inexpensive method by which upto 50 samples can be measured per day. However, it is not reliable for sediments containing OM less than 8-10%. TOC measurements, on the other hand, can be reliable for sediments containing minor amounts of OM, ~1% or even less. However, TOC measurements are more expensive and require more pre-treatments such as carbonate removal and grinding etc. For both methods, it is unlikely to achieve measurement resolution more than 5 mm. ITRAX micro-XRF core scanner, which can provide variations of 15-20 elements along sediment cores, can reach measurement increments as fine as 0.2 mm. Even though ITRAX can produce high-resolution data in relatively short times with minor labour, the produced data suffers from a major weakness. OM content, particle size-distribution, mineralogical and density variations may significantly affect the results. This study illustrates how this weakness can be used to estimate OM content of sediments at resolutions that cannot be achieved by conventional LOI550 and TOC methods. A total of 19 m-long sediment cores from four lakes in Turkey and one lake in Iceland were scanned by ITRAX at 0.5-2.0 mm resolution. OM content of the sediments was quantified by 970 LOI550 and 490 TOC measurements at 1-2 cm increments. Multiple regression analysis was utilized to generate formulas specific to each lake in order to estimate the measured OM content values by ITRAX data. Accordingly, the generated formulas successfully provided estimations with correlation coefficient values (r2) around 0.95. Even if the

formulas were generated based on the measurements at 10 cm increments, the original OM content values (i.e., at 1-2 cm increments) could be estimated with correlation coefficient values around 0.85. The current results show that millimetre-scale OM content approximations can be obtained by this method.
