APPLICATIONS OF HANDHELD XRF ANALYSIS IN METEORITICS. F. J. ZURFLUH[1,2], B. A. HOFMANN[2], E. GNOS[3] and U. EGGENBERGER[1]. [1]Institute of Geological Sciences, University of Bern, Switzerland. E-mail: florian.zurfluh@geo.unibe.ch. [2]Natural History Museum Bern, Switzerland, [3]Natural History Museum Geneva, Switzerland.

Introduction: In recent years, the improvement of field portable X-ray fluorescence (FPXRF) devices reached a high level and such instruments are now in use in several disciplines such as soil sciences, remediation investigations, mining industry, archaeological sciences, metallurgy and several others [e.g. 1]. We are testing the application of this method on meteorites. Our main focus is the fast identification of questionable meteorites in the field and quantification of weathering properties of the meteorites and soils. Here we present first results from the evaluation of the instrument and from our fieldwork in Oman 2009.

Methods: In a first step the accuracy and precision of the FPXRF was investigated by use of international standards. Since both factors are matrix dependent, test measurements were performed with own reference standards such as meteorites, mafic rocks and soil samples that were analyzed by ICP, ICP-MS and standard XRF. These results were compared with the values obtained by FPXRF. Samples were measured as hand specimen, as powders in thin plastic bags, as powder press pills or glass pills with variable measuring time.

Results: With the Niton XRF analyzer XL3t-600 it is possible to measure elements from K and U. Two modes are available: "soil mode" for medium concentrations (between ~100 ppm to 1%) and "mining mode" for higher concentrations (> 1%). Best results were obtained for the important weathering proxy Sr [2] with a detection limit of 9 ppm at 80 s counting time. Also in an acceptable range are the important and typical meteoritic elements Fe, Mn and Ni. Additional Ca, Cr, K and Ti are confident. Multiple measurements tend to be reproducible after ~80 s; reproducibility is in all cases reached by using a measurement time of 180 s.

Applications: A portable rapid, non-destructive and simultaneous multi-element analytical apparatus is very useful for fast identification of uncertain meteorites in the field. In a field campaign for scientific meteorite search in early 2009 in the Sultanate of Oman we could identify several meteorite wrongs by use of FPXRF. Achondrites were fieldclassified by their major element concentrations (Fe, Ca, Fe/Mn ratio). It is also possible to distinguish the three groups of ordinary chondrite (OC) by their bulk Fe and Ni contents in case of low weathering. Earlier studies showed an uptake of Sr in OC's during their terrestrial residence and a loss of Ni into underling soils [2]. With FRXRF both effects are quantifiable. A comparison of measurements on outer parts and cut slabs of meteorites indicate an enrichment of Mn and Sr on surfaces due to a possible thin desert varnish.

Conclusions: Handheld XRF is a new powerful analytical method that has a high potential in meteoritics. Advantages are its rapidness and the nondestructive analysis mode. Accuracy is not as high as for other laboratory analytical methods but lies in an acceptable range for many applications.

References: [1] Hou et al. 2004 *Applied Spectroscopy Reviews 39 Nr. 1, 1-25* [2] Al-Kathiri et al. 2005 *Meteoritics & Planetary Science 40 Nr 8, 1215-1239.*