Original, rapid and *in situ* colorimetric method for Acid Volatile Sulfide determination in sediment using a smartphone camera

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Introduction: During dredging operations, the quantification of metallic trace elements (TM) is essential in order to classify the various sediments collected for future deposits on agricultural soils, urban.... In a sediment, during the diagenetic degradation processes of organic matter, a large part of the TM can precipitate with the sulfides (freshly formed) in the form of metallic sulfides (AVS: Acid Volatils Sulfides). Metals can be then trapped over a longer or shorter period and be therefore less available (and less toxic for overlying benthic organisms or/and future soil organisms, among others. This is in this context that it was proposed to optimize the "classic" method of extraction of AVS to adapt it to a rapid and *on-site* method.

Methods: The challenge of this work was to adapt this classical, in laboratory, long and cumbersome method to an original, *on-site* and fast method to carry out an efficient screening of the AVS contents in dredged sediments. For this, several parameters were optimized to accommodate extraction and detection under *in situ* conditions. Thus, the extraction time (from 1h to 30 min), the mineralization solution (from HCl 6M to HCl 1M) have been reduced for more efficiency and less dangerousness. In the same way, since it was not possible to transport a nitrogen bottle in the field, the detection of sulfides was envisaged directly in the extraction solution after a filtration at 0.45 µm. This detection was performed by colorimetry through the formation of a methylene blue complex. Classically, this blue complex is detected by UV-Visible spectrometry. However, in order to adapt to the field conditions, the colorimetric measurement was done using the camera of a smartphone (easy to carry, fig. 1). The image obtained was processed using the "Spectraphone" application newly developed in our laboratory. This application allows the image to be transformed into grey level and compared to a calibration range performed under the same conditions.

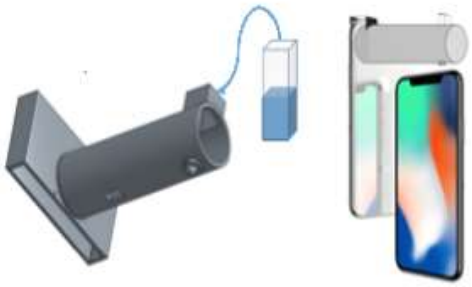

Fig. 1: AVS detection using a smartphone camera

Results and Discussion: Although the AVS contents determined by this new method are slightly lower than those obtained using the conventional technique, the order of magnitude is still largely acceptable for dredging operations and the determination of sediment toxicity levels. Thus, the results obtained are very encouraging and make it possible to consider this technique as an original method for rapid screening of sulfides and AVS on site (Fig. 2). During this presentation, a focus will be put, among others, on the estimation of the degree of error induced during each optimization step.

Fig. 2: AVS measurements on site

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