EXPLORING THE VARIABILITIES IN THE IVORY COAST TEKTITE STREWN-FIELD. P. ROCHETTE[1], P. SORO[2], D. BARATOUX[2,3], A. N. KOUAMELAN[2], V. ANDRIEU[1],.O. MONDA[4], M. Gounelle[5] [1]Aix-Marseille Université, CEREGE, Centre National de Recherche Scientifique, France, rochette@cerege.fr [2]UFR STRM, Université Félix HOUPHOUËT-BOIGNY, Cocody, Abidjan, Côte d'Ivoire, petanksoro@gmail.com, [3]Géosciences Environnement Toulouse, Université Paul Sabatier, CNRS & IRD, 14, Avenue Edouard Belin, 31 400, Toulouse, France, [4]Laboratoire d'Analyse Minérales, SODEMI, Cocody, Abidjan, Côte d'Ivoire. [5] IMPMC, CNRS - UMR 7590, Sorbonne Universite, Mus ´ eum national d'Histoire naturelle, 75005 Paris, France.

Résumé: le champ de tectites de Cote d'Ivoire a été très peu étudié, avec seulement quelques dizaines d'echantillons analysés, montrant une forte homogeneité. Grâce à une nouvelle collecte de plus de cent tectites sur le terrain, et la mesure des collections de la SODEMI à Abidjan, du MNHN et de collections privées en France, nous avons amassé une base de données concernant plusieurs centaines de tectites. La susceptibilité magnétique et la fluorescence X portable permettent d'identifier les rares echantillons dont la composition chimique s'écarte de la moyenne.

Introduction: The Ivory Coast tektite strewn-field, discovered 90 years ago by Lacroix [1], has been submitted to limited investigations, on a few tens of samples [1-4]. Their chemical analyses have revealed a particularly homogeneous material. As an example the published range in SiO_2 and FeO, except one sample from Lacroix, is 66.2-69.1 and 5.8-6.8 wt%, respectively. Recently, we started new field prospections [5] leading to expanding the known strewn field and recovering more than 100 specimens. We also studied the SODEMI collection in Abidjan (285 samples), the Paris Museum and two private collections in France. Magnetic susceptibility has revealed to be an efficient way to identify rapidly rare samples with anomalous FeO contents or magnetic inclusions [6]. Another non destructive technique able to identify chemically anomalous samples is X-ray fluorescence [7].

Results: The world collection of Ivory Coast tektite is estimated to amount to over 700 samples. We were able to obtain magnetic susceptibility measurements on over 400 samples. Excluding four outliers at more than 3 σ, we obtained an average susceptibility of 116±6 10^{-9} m^3/kg with a range 100-134. Two outliers with susceptibility values of 58 and 81 has been identified the SODEMI and Paris Museum collections. They appear translucent with a greenish-brown color. The anomalous sample from Paris can be securely identified as being the Akacomoekro sample for which Lacroix reported SiO_2 and FeO content of 76.6 and 4.1 wt%, respectively. Two other outliers have susceptibility values of 137 and 139. This may be due to soil incrustations. Two samples we recovered in Adzope yield consistently low susceptibities (107 and 110), indicative of lower than average FeO content.

XRF, performed on over 120 samples, also allowed to explore the chemical variability of the collection. Cr content varies from 80 to 430 ppm (range from [4]: 220-290). To minimize the geometric and surface state bias inherent to the XRF technique, we investigate the element ratio that showed the larger ranges together with good precision on individual elements, using the higher X-ray energy. Fe/Ca, K/Ca and Sr/Zr show ranges of 1.5-7.9, 0.44-2.6 and 1.5-3.9, respectively. Their median values were 4.8, 1.5, 2.0, respectively. This allowed again to identify chemical outliers. A mixing line between two poles appears in the ratio cross-plots (Figure). It remains to confirm that this is not an artifact of the XRF technique. In total, we selected for further destructive chemical (ICPMS) and isotopic (Sr,Nd) analyses 6 anomalous tektites plus a standard one. Results should be available for the meeting. Despite the observed chemical variability within ivorites, XRF easily discriminates them from australasites using in particular Sr/Zr ratio (Figure). This complement the discrimination brought by susceptibility [6]: australasites gave an average value of 90 ±10 10^{-9} m^3/kg, although rare samples exceed the value of 110, i.e. overlap with ivorites.

During our field work we identified an odd large fragmented glass sample, that ressembled more a degassed slag than a splash form tektite. However, it is also very distinct from the standard iron metallurgy slag commonly observed in the strewn-field. It is strongly magnetic and Fe rich. It contains quartz-cristobalite inclusions as well as crystallites of pyroxene and iron oxide. We wait for further investigations to decide on its eventual association with the tektite strewn-field.

Discussion and conclusion: our revisitation of the Ivory Coast strewn field and investigation of large number of samples allowed to establish a much larger chemical variability than previously thought (but see [1]). Interestingly, a geographic control of this variability may be suggested: the FeO poor samples from Akacomoekro and Adzope correspond to the north-eastern and southern extremes of the strewn-field, respectively. They are distant by 165 km. We expect that further investigations on this compositional variability will shed new light on the tektite formation process and target variability.

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Figure : Cross-plots of selected element ratio obtained using an XRF analyser Niton XL3t GOLDD+ instrument in Abidjan and Paris. Concentrations are given in log-scale. Australasites, measured in Abidjan in the same conditions, are not shown for K/Ca as results are not discriminant contrary to Sr/Zr.