GAMMA RAY SPECTROMETRY ON THE ROCHECHOUART IMPACT STRUCTURE: ORIGIN OF K ENRICHMENT IN IMPACTITES & 3D MAPPING OF THE EXTENT OF K METASOMATISM.

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Résumé : Ce travail s'intéresse à l'enrichissement en K des impactites de la struture d'impact de Rochechouart. A travers les données radiomètriques aéroportées, des mesures *in situ* des concetrations en K, Th et U de la zone d'impact et des données de gamma logging, nous discutons de l'origine hydrothermale de cet enrechissment. Nous avons cartographier également en 3D (de la surface en profondeur), le meatasomatisme en K.

Introduction: Airborne and ground radiometric surveys are commonly used in geological mapping for mineral exploration, especially in tropical regions where outcrop conditions are poor [1,2]. Radiometric maps of surface concentration of K, Th, and U at different scales are produced from measurements (counts) of the gamma rays emitted during the disintegration of the natural radioisotopes ^{40}K, ^{232}Th, and ^{238}U. A recent survey of radiometric signatures of impact structures in Australia, West Africa and France indicate that circular anomaly in K, Th, or U are common for large impact structures (> 3 km). The origin of these anomalies, elucidated from field observations or from the available information in the literature includes structural deformation, hydrothermal alteration, and post-impact erosion/alteration with a strong control by the topographic expression of the impact crater at the time of formation [3].

Radiometric signature of the Rochechouart impact structure: the Rochechouart impact structure shows a particular radiometric signature marked by K enrichment of impactites. Here, we examined the distribution of concentration of K in 3D, based on geochemical data (rock samples analyses available in the literature), ground observations using a handheld gamma-ray spectrometer (BGO RS230), gamma-ray downhole logging data, and an airborne survey. The results confirm a K enrichment of impact breccias relative to target (Figure 1) previously reported from geochemical analysis (Lambert 2010 and reference therein).

Distribution of K in target rocks and impactites - role of the K metasomatism: frequency distributions of K in rocks in both ground and airborne data verify that K enrichment is not the result of surficial processes although the crater is highly eroded, but relates to post-impact hydrothermal activity driven by molten rocks formed by the impact event, as previously reported by Lambert (2010). The airborne radiometric and gamma ray downhole logging data allowed us to map the extent of this K-metasomatism in 3D for the first time. Indeed, there is a clear variation of K with depth marqued by a decreasing of K concentrations with depth (Figure 2). The absence of correlation of K and U indicates that the metasomatism has not affected U, despite the fact that this element may be mobile in oxidizing conditions. However, further ground measurements particularly in non-deformed rocks away from the crater fill deposit would be useful to add constraints on the distribution of K. A higher-resolution airborne survey of the central area of the

impact structure would also be useful for complete mapping of the diversity of impactites and the relative intensity of metasomatism.

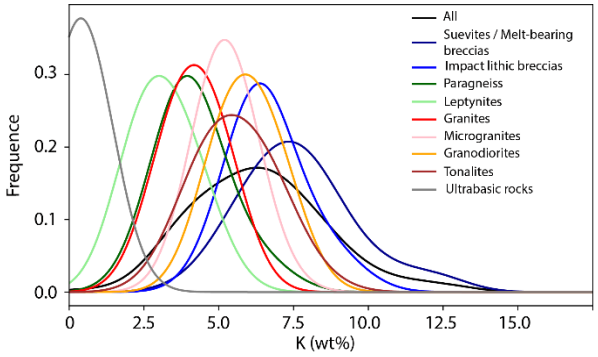

Figure 1: Distribution frequencies of K, Th and U concentrations of the different lithologies of the Rochechouart impact structure from ground measurements, illustrating the K enrichment of impact breccias.

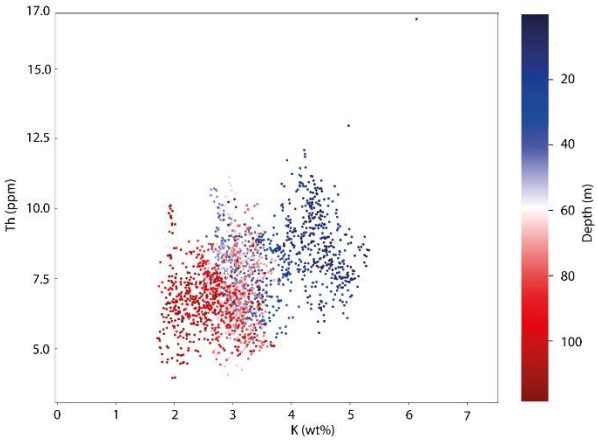

Figure 2: Scatter plot of Th versus K in hole SC2 provided by spectral gamma-ray probe. The distribution of K and Th contents shows a concentration of data between 2 - 5 wt% and between 2.5 - 12 ppm respectively. K concentrations decrease with depth. The large dispersion of the data shows that there is no clear correlation between K and Th, nor between Th and depth, but there is a clear variation of K with depth.

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