EFFECTS OF MICROSTRUCTURE LAMELLAE ON U-PB IN ROCHECHOUART SHOCKED ZIRCON.

L. Shteynman, T. G. Sharp. School of Earth and Space Exploration, Arizona State University, Tempe AZ, USA 85287-1404 (leah.shteynman@asu.edu)

Résumé: La datation des événements de cratérisation d'impact est extrêmement importante, en raison de leurs relations avec les origines de la vie sur Terre, les extinctions de masse, les échelles de temps absolues, etc. La plupart des structures d'impact terrestres manquent d'âges précis. La structure d'impact de Rochechouart fait exception. La compréhension du comportement du système U-Pb dans les microstructures de choc en zircon pourrait nous permettre de dater davantage d'événements d'impact. La structure d'impact de Rochechouart est le candidat idéal pour obtenir et étudier des exemples naturels d'une telle microstructure : la reidite. Le travail présenté ici vise à analyser directement la reidite de la structure d'impact de Rochechouart.

Introduction: Only ~20% of known terrestrial impact structures have been accurately dated with precision ≤2% [1]. The majority of these ages were obtained using either the U-Pb or $^{40}Ar/^{39}Ar$ methods [1]. The utilities of both techniques are significantly limited by both conditions experienced during and after impact, as well as the variable preservation and accessibility of dateable materials. To make significant advances in the impact dating effort, it may be necessary to develop new techniques.

Previous workers [2-6] have considered whether shocked zircon may serve as a recorder of impact ages. Most zircon shock microstructures have been either explicitly or de facto ruled out as dateable materials due to their complex effect on the U-Pb system of zircon as well as their small size. Our work seeks to probe reidite lamellae more directly than has been done in previous efforts. While reidite was once considered to be extremely rare, it has been found at more impact structures in recent years. Learning more about the effects of shock microstructures such as reidite on the U-Pb system of zircon is a goal in and of itself, but it could also potentially lead to new dating techniques.

Samples: Especially with the recent discovery of relatively large quantities of reidite in the Chassenon suevitic breccia [7], natural samples from Rochechouart impact structure are ideal for this work. Rochechouart has been well-studied with independent multi-proxy chronometry dating the impact to ~204-207Ma [8-10]. Impactites having experienced a wide range of shock stages/conditions (8 to >45 GPa), as well as an exceptionally full set of impactite types, are found at Rochechouart [7,8,11]. Behavior of the U-Pb system of reidite formed during impact would yield much valuable information when compared with the wealth of geochronology already done at Rochechouart.

Samples for this work must contain reidite. A sample of the Chassenon suevitic breccia from Grosse Piece quarry is being used for this work. Previous work has classified this polymict breccia to minimum shock stage III [11,12]. It is a gray-green color with equal parts fine-grained matrix and impact-melt, glass, and lithic clasts.

Approach: This project is currently in early stages. Thin sections and grain mounts have been made and characterized using optical microscopy. Zircon grains and microstructures are being identified and characterized using backscattered electron imaging using an electron microprobe at Arizona State University. Electron backscatter diffraction will be used to further characterize microstructures in shocked zircons.

Focused Ion Beam (FIB) will be used to determine the subsurface orientation of reidite lamellae, cut cross-sections of microstructure/host interfaces out for characterization using high resolution transmission electron microscopy (TEM), and excavate lamellae for direct U-Pb measurement using secondary ion mass spectrometry (SIMS). Overall, the goal is to better understand the effects of reidite formation and presence on U-Pb behavior and distribution in both reidite and host zircon.

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