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Résumé: L'étude à la microsonde électronique d' échantillons d'impactoclastite issus des forages SC1-3 à Chassenon, permet d'y reconnaître et de caractériser des sphérules d'impact et des particules de fusion qui suggèrent que cette roche contient des composants du panache de vapeur d'impact.

Introduction: Impactoclastite is ash-like material mainly composed of mineral debris with macroscopic layering that occurs in a ~2 km^2 region ca. 4 km NW of the presumed center of the impact structure near the community of Chassenon [1]. Impactoclastite occurred in a quarry capping suevite as a layered rock composed of mineral and rock debris devoid of impact melt with a particle size of 10–150 µm [1]. In contrast, macroscopically similar, layered impactoclastite occurs as dikes cutting the Chassenon suevite to a depth >30 m in CIRIR drillcore SC2 [2]. Notably, the dike-impactoclastite contains impact melt particles and both impactoclastite lithologies contain impactor components [3].

We studied Chassenon impactoclastite dike samples to test if they are impact-vapor plume deposits.

Samples & Methods: We analyzed three petrographic thin sections of two samples of impactoclastite from Chassenon with an optical microscope and a JEOL-JXA 8530F field-emission electron microprobe equipped with an energy-dispersive spectrometer (EDS) at Arizona State University. One of the samples is from a surface outcrop and the other is from a depth of 0.46 m in drillcore SC3 [2].

Results: Common impactoclastite dike components are ~100 µm vesicular impact melt shards and shock metamorphosed tectosilicate clasts. However, unshocked clasts dominate, including mica flakes that indicate the distinct layering. No spherules were found in a thin section of a relative coarse region of an impactoclastite dike in drillcore SC3 but thin sections from a finer region of the same sample and from an outcrop sample contain 6 round to oval, 90–130 µm spherules that are altered to phyllosilicates rich in Mg, Al, Si, and K. Two of these spherules were hollow and one is chipped. Two other spherules incorporated 20 and 30 µm sub-rounded clasts of potassium feldspar and SiO_2 near their rims, respectively (Fig.1). Notable inclusions in these spherules are a ~2 µm Ni-Fe sulfide (pentlandite?), a <1 µm zircon, and a <1 µm monazite.

Discussion: Spherules in the Chassenon impactoclastite dikes suggest these rocks are impactoclastic air fall beds [1], similar to deposits overlying suevite in the Bosumtwi and El'gygytgyn craters [4,5]. The spherules (Fig. 1) bear features of microtektites [6], suggesting ballistic transport. This could constrain spherule fallback to within 1 day after impact [6]. Impactoclastite dike layering that is alingned parallel to the vertical trending dike contacts [1], suggests rapid and forceful emplacement, which likely precludes settling through water.

Hypothesis: The Chassenon suevite/impactoclastite outcrop was probably situated in a depression that allowed its preservation. The melt-free surficial impactoclastite airfall bed on top of suevite could have settled early because it had separated from higher energetic, melt-rich ejecta. Block movements caused by gravitational adjustment after central peak collapse may have caused a mass deficiency in the crater floor during the fallback phase hours to a few days after the impact, ramping down the ~2 km^2 region. These late localized mass movements may have opened fissures and triggered sudden decompression [7], which sucked fine impactoclastic matrial into these fissures.

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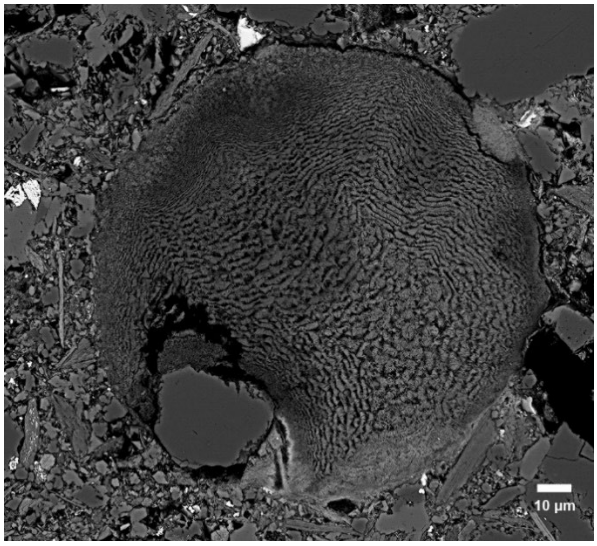

Fig. 1. Impact spherule in impactoclastite dike sample SC3_0.46 m; back-scattered electron image.