The Mien impact structure

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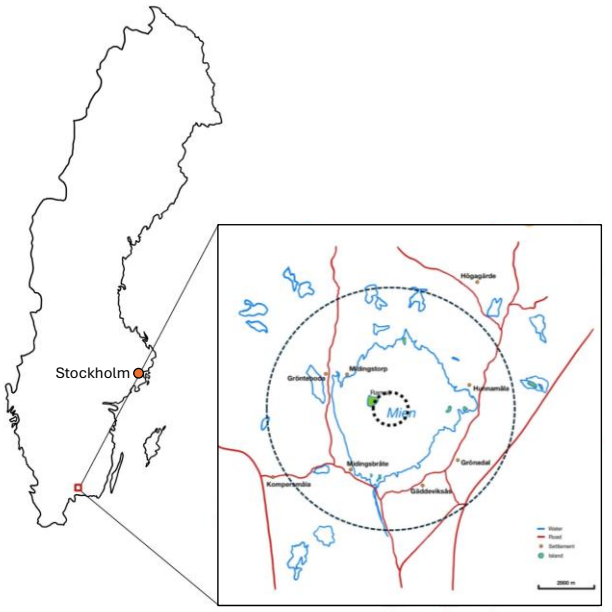
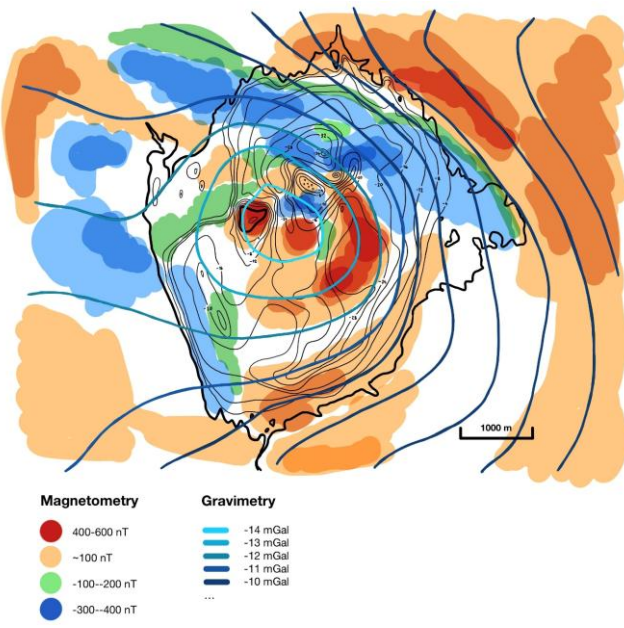
Structural and petrographic characterization of the Mien impact structure, Sweden

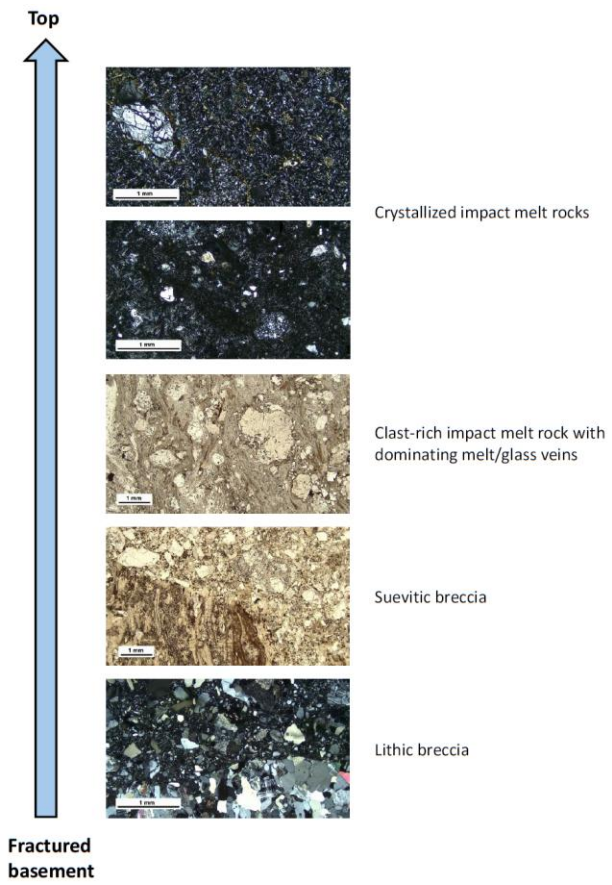
The Mien structure, a partly lake-filled depression in southern Sweden, was confirmed to be an impact structure in the 1960s. The structure formed about 120 Myr ago. Poor exposure of outcropping bedrock in and around the lake, due to a thick cover of glacial sediments, has made morphological mapping and impactite classification challenging. Constrains on the diameter and morphological features such as the central uplift of the structure are solely based on geophysical measurements from the 1980s and 1990s. Impactites have been found as glacial boulders around the southern shore of lake Mien and in drill cores retrieved from the island Ramsö in the central part of the lake. The latter are the only findings of in situ impactites. This study combines field mapping with a review of geophysical measurements, as well as petrographic and petrological analysis of sampled impactites and pre-existing thin sections from earlier studies on Mien. This has led to an allocation of the impact structure's centre and central uplift to coincide with the centre of the lake, constrains on the distribution of impact melt rock and the identification of Ramsö as a likely crater fill remnant. In this thesis two types of lithic breccia, two types of suevitic breccia and five types of impact melt rock have been identified. Findings of larger structural features, such as rim faults and radial fractures, that could assist the assignment of crater diameter and overall morphology, proved unsuccessful due to the advanced erosion of the impact structure and the poor access and quality of outcropping bedrock.



Map of the Mien lake and its location in Sweden, the thicker dashed circle in the centre of the lake marking the central uplift of the Mien impact structure and the thinner dashed circle marking the original crater.



Map of combined geophysical measurements from th Mien Lake and surroundings



Suggested stratigraphy of impactites at Mien, upward increase of shock metamorphism