

THE EAST BAVARIAN METEORITE CRATER ASSEMBLAGE REVITALIZED - PROBABLY LINKED TO THE RIES CRATER (GERMANY) IMPACT EVENT. K. Ernstson, University of Würzburg, D-97074 Würzburg, Germany, kernstson@ernstson.de.

Introduction: In the early seventies the reputable Bavarian geologist Erwin Rutte published a new hypothesis on a much more far-reaching Ries crater impact event (Fig. 1) causing quite a strong recognition in the geologic community [1, 2]. However, a vehement rejection by the traditional German impact researchers and the Bavarian Official Geologic Survey followed promptly [2, and references therein], which led to widespread ignorance and let the hypothesis fall into oblivion except for a few references on the Internet. While the German impact researchers did not appreciate the hypothesis at all from then on, complete rejection came from the direction of geology, especially from the direction of the geological offices. In principle, all new findings published by Rutte and his students concerning a new regional geology to be seen were characterized as not worth further attention, partly with absurd counter-arguments. Even in recent times, geologists of the Bavarian State Office (*Landesamt für Umwelt, LfU*) maintain the claim that all impact craters postulated by Rutte are sinkholes and generally karst phenomena, and that the polymictic shocked alemonite breccias were formed by weathering near bogs, after earlier even fluctuations of the water level of freshwater lakes were held responsible for their formation.

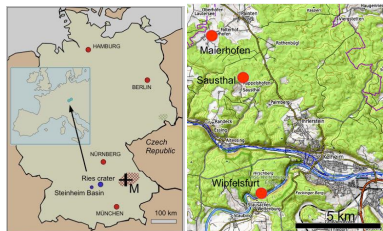


Fig. 1. Location map for the structures under discussion (M = Maierhofen, left). OpenTopoMap (right).

The present contribution follows recent investigations with important findings on the enigmatic alemonite polymictic impact breccias, which clearly support the correctness of Rutte's hypothesis on the strongly extended Ries crater event [3]. Here the second focus of Rutte's hypothesis is resumed and it is shown that also the existence of further impact craters can be proved with the help of new methods.

The Sausthal doublet crater: Already in Rutte's time, the Sausthal crater was described by him as the best preserved model crater in the area of the impact overprint. Today, with the high-resolution Digital Terrain Model, even in the dense forest area, the contours with the ring wall around both structures are clearly worked out (Fig. 2), which is especially expressed in the profile sections (Fig. 3). The young post-impact lake deposits hide a central elevation detected

after geophysical measurements (Fig. 4). Excavations in the steep northern rim of the crater have revealed extreme fragmentation and deformation of the Solnhofen limestones, which was still observed 1 km to the south during intermittent limestone quarrying (Fig. 5).

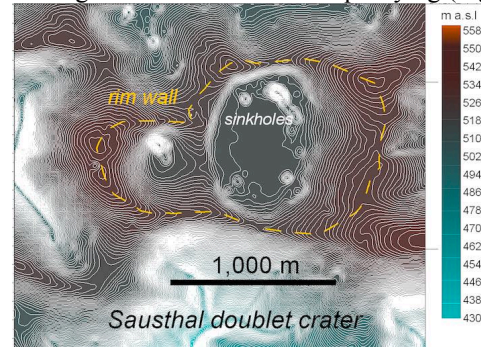


Fig. 2. The Digital Terrain Model (DTM 25) of the Sausthal doublet crater exhibiting a distinct rim wall. Counter interval 0.4 m.

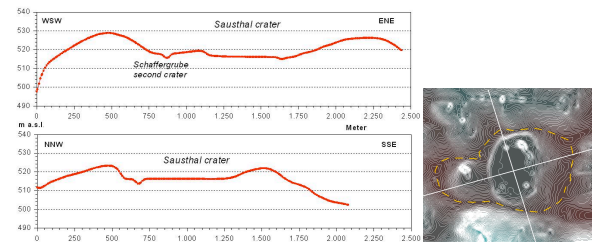


Fig. 3. Sausthal crater: Topographic profiles taken from the Digital Terrain Model.

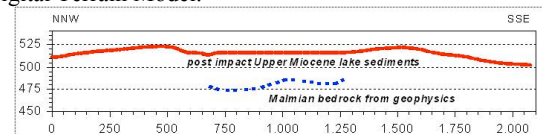


Fig. 4. The NNW-SSE profile with Malmian limestone bedrock sketched from geoelectric measurements [2].



Fig. 5. Left: Limestone quarry about 1 km south of the Sausthal crater showing the extreme destruction caused by the impact. Photo taken at the time of Rutte's research. Right: Abandoned quarry in Malmian limestones 3 km west of the Maierhofen structure. The peculiar destructions exclude tectonics and karstification. Recent photo.

The Maierhofen structure: The Maierhofen crater was also described in some detail by Rutte as a bowl of not exactly defined size with a ring wall [2]. According to geoelectric measurements, the bedrock crater floor

should be on average 50 m deep and form a bulge in the center. Here, the map and profiles of the Digital Terrain Model show clearer contours (Figs. 6, 7) and indicate a depression of at least 4 km diameter and more or less strongly indicated inner rings. Here, too, outcrops in Malmian limestones of the neighborhood show extreme destruction (Fig. 5).

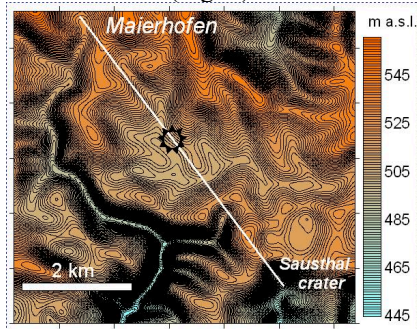


Fig. 6. The circular Maierhofen structure from the DGM 25. Contour interval 0.5 m.

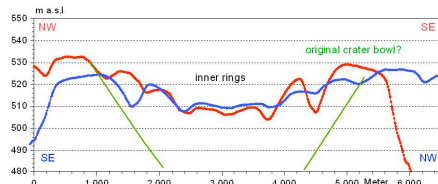


Fig. 7. A topographic profile for the line in Fig. 6. The blue profile is the mirrored red profile, which shows a diametrical symmetry across the structure with the possible existence of inner rings.

The Wipfelsfurt questionable impact crater: Further discussed here is a conspicuous structure described by Rutte as the "exemplary crater circular form of Wipfelsfurt" [2] (Fig. 8). In the case of this structure, doubts are certainly warranted as to whether it belongs to the cluster of impact craters otherwise described by him, despite its remarkable shape. Critics interpret the round shape simply as a removal structure of the Danube, which Rutte rejects with reference to the too small radius of curvature of the crater for such a process. In this argument, however, he overlooks the fact that only a few kilometers upstream of the Danube the river forms exactly such a narrow loop which would easily fit into the Wipfelsfurt crater (Fig. 8).

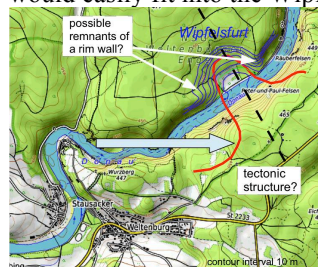


Fig. 8. The Wipfelsfurt crater at the Danube with arguments against an impact nature (see text). OpenTopoMap, contour interval 10 m.

Slight hints of a rampart at the exit of the crater towards the Danube could speak for an impact, however,

no traces of a rampart are found in the northern and northwestern rim on the plateau. Conversely, the surrounding topography could also indicate a tectonic fault that would pass exactly through the hollow form (Fig. 8). An impact origin for Wipfelsfurt seems to be doubtful.

Discussion and conclusion: The hypothesis put forward by Rutte about 50 years ago and published 20 years ago in a summarized form [2] about much extensive concomitant phenomena of the Ries impact event, was completely ignored by German impact researchers and fiercely opposed by Bavarian geology, especially by the official geologists. This is not surprising, since according to Rutte's hypothesis, which did not originate from a spontaneous idea, but was based on years of thorough field work and mineralogical-petrographical investigations together with a large number of students with published results, a complete rethinking of the Tertiary geology and the previous mapping together with new interpretations on mineral deposit formations was required for the region there. Until today, this rethinking has not taken place in Bavarian geology, but on the contrary, the old, partly absurd counter-arguments are repeated [4]. The main elements of Rutte's hypothesis on the extended Ries impact listed in the introduction were the newly found impact craters and the alemonites clearly characterized as impactites, and the main elements of the opposing criticism was the karstification with sinkhole formation, which should have produced the craters, and some kind of weathering in the alemonite formation. The absurdity of the alemonite formation near bogs and freshwater lakes was already emphasized again recently, and the impact genesis was clarified by new investigations [3]. The re-evaluations of the craters of Sausthal and Maierhofen with wall-surrounded depressions and outrageously extreme disintegrations of the surrounding Malmian limestones, shown here, consigns the equally absurd explanations of the critics as karst formations to the realms of fantasy. With this extensive research on a new geology in Rutte's study area, which has not grown in decades through the work of dozens of geologists, it is not surprising that not all criticism of the hypothesis must be dismissed. As an example the crater Wipfelsfurt is described here, where it seems questionable whether Rutte is right here with his hypothesis of an impact formation, which should not lead again to lumping everything together.

References: [1] Rutte, E. (1971) *Geoforum*, 7, 84-92, [2] Rutte, E. (2003) *Land der neuen Steine*, 110 p., Regensburg (Univ.Verlag) [3] Ernstson et al. (2019) 50th LPSC, 1370.pdf [4] Eichhorn, R. et al. (2012) *Nicht von dieser Welt - Bayerns Meteorite* (LFU, ed.), 126 p.