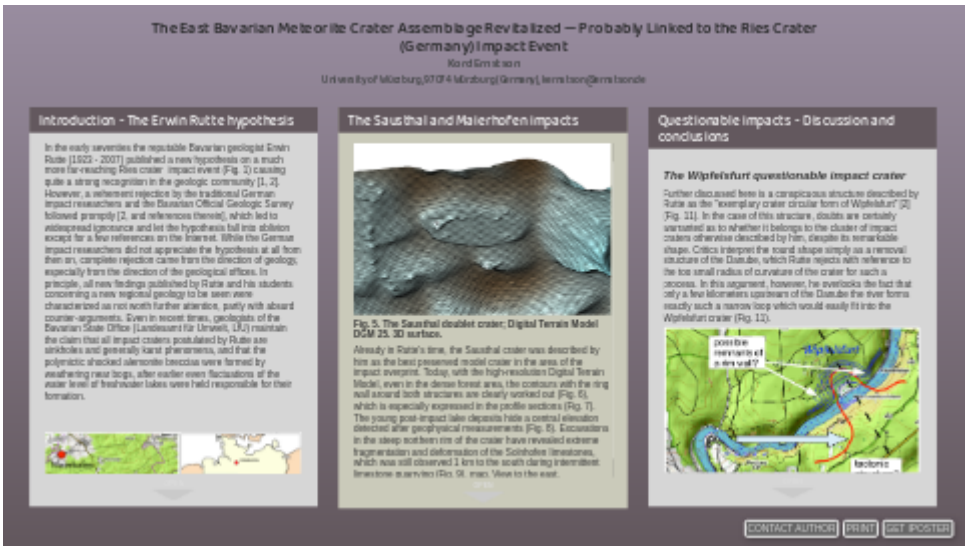
The East Bavarian Meteorite Crater Assemblage Revitalized — Probably Linked to the Ries Crater (Germany) Impact Event



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PRESENTED AT:

INTRODUCTION - THE ERWIN RUTTE HYPOTHESIS

In the early seventies the reputable Bavarian geologist Erwin Rutte (1923 - 2007) 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.

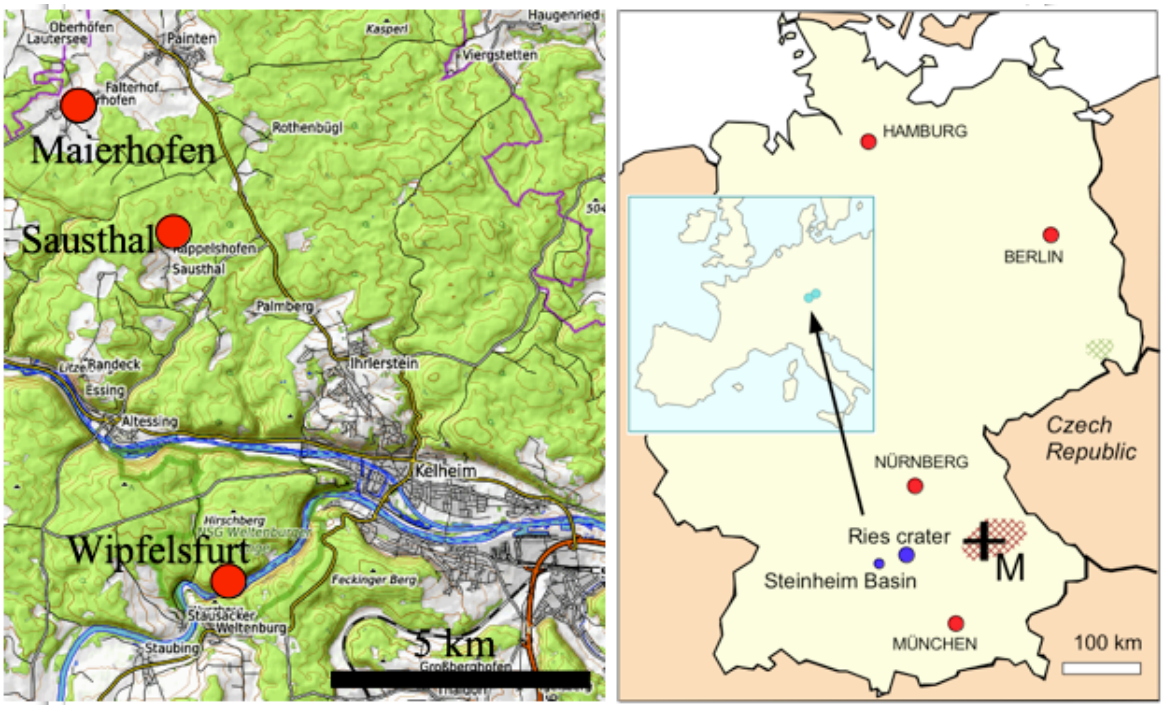

Fig. 1. Location map for the structures under discussion (M = Maierhofen, right). OpenTopoMap (left).

The alemonite impactite enigma

First described by Rutte in 1971 [1], alemonite originated during the Ries impact event, when pressure, temperature and delivery of vast quantities of cosmic silica initiated heavy fracturing and melting of local Jurassic, Cretaceous and crystalline rocks of various lithologies thus forming a variety-rich and characteristic new rock. Depending on the source rocks, breccias and silicifications of various whole rock units were formed, which led Rutte to speak of alemonitization, which should have affected entire regions with a concentration in the Altmühlalb and Upper Palatinate, and some extension to South Bohemia and Austria. A cut of a typical almonite polymictic breccia is shown in Fig. 2, and photomicrographs of thin sections reveal examples of common glass particles (Fig.3) and shocked quartz grains (Fig. 4). More about the alemonite phenomenon may be read here. (http://www.hou.usra.edu/meetings/lpsc2019/pdf/1370.pdf) and studied here. (http://www.impact-structures.com/wp-content/uploads/2019/04/Poster-Alemonite-6.3.2019-Komprimiert-3.pdf)

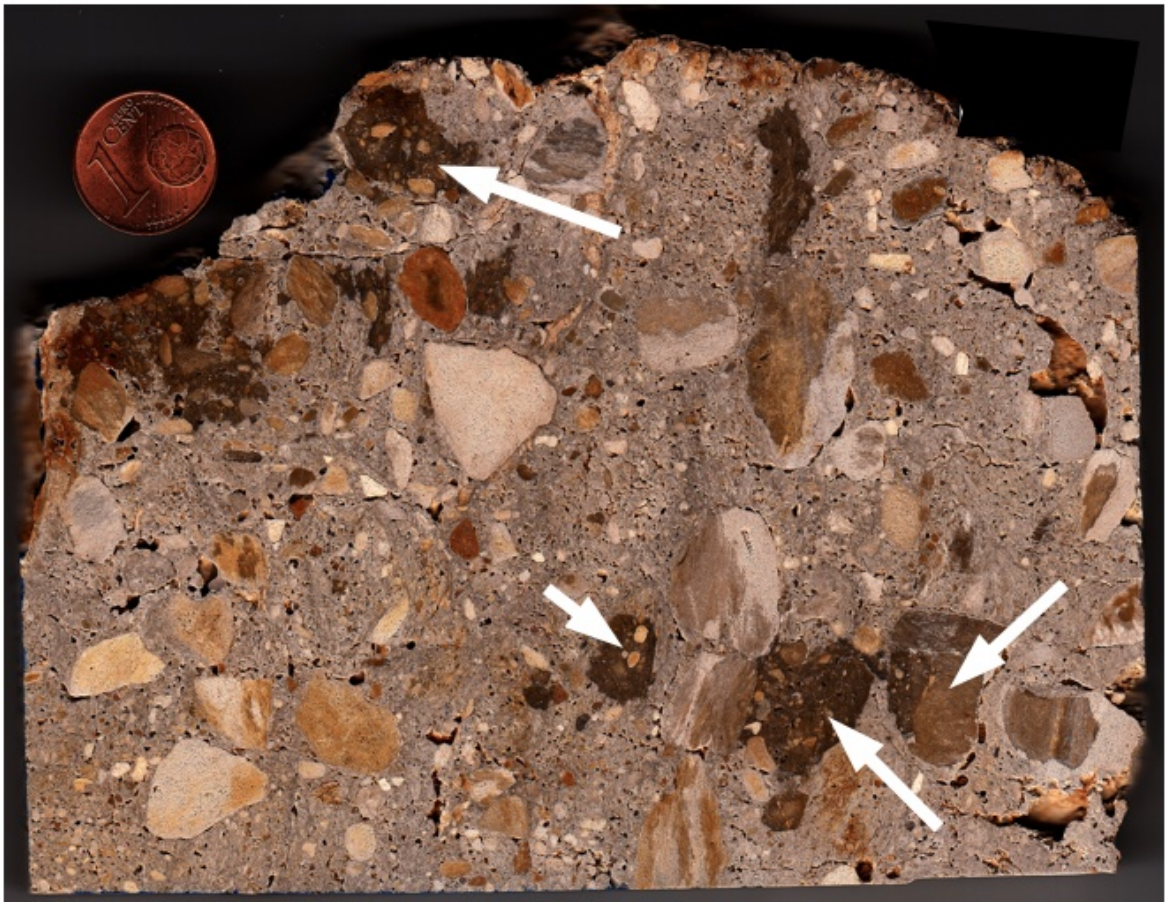

Fig. 2. Typical polymictic alemonite impact breccia. Note the breccia generations (breccias-within-breccias, arraows), which are practically unknown in normal geological processes but represent a characteristic of impact processes with rapidly successive phases of excavation, ejection, landing of ejecta with mixing with local material and finally movements of crater modification.

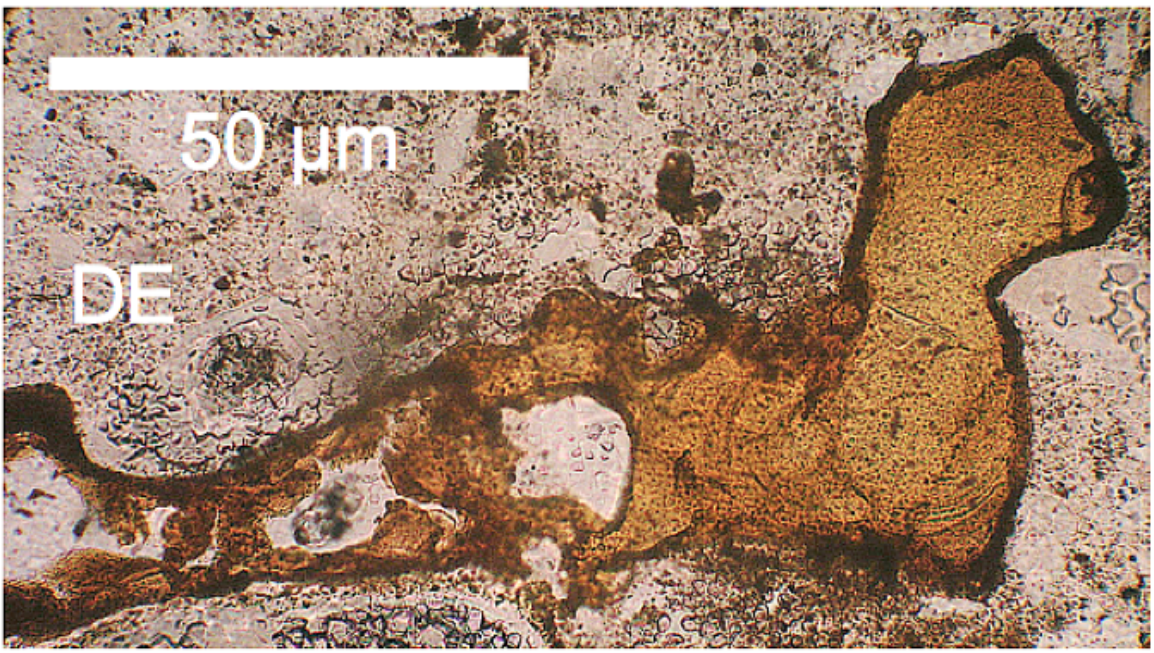

Fig. 3. Glass particle with schlieren in alemonite breccia.

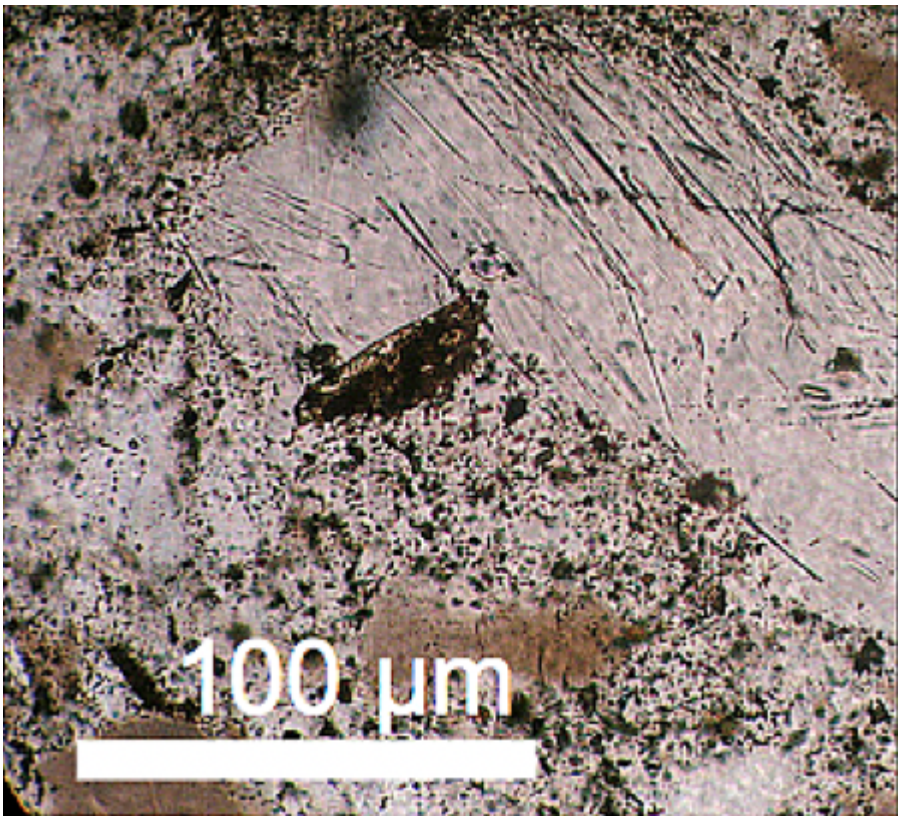

Fig. 4. Shock metamorphism: Multiple sets of planar deformation featues (PDF) in alemonite quartz grain.

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.

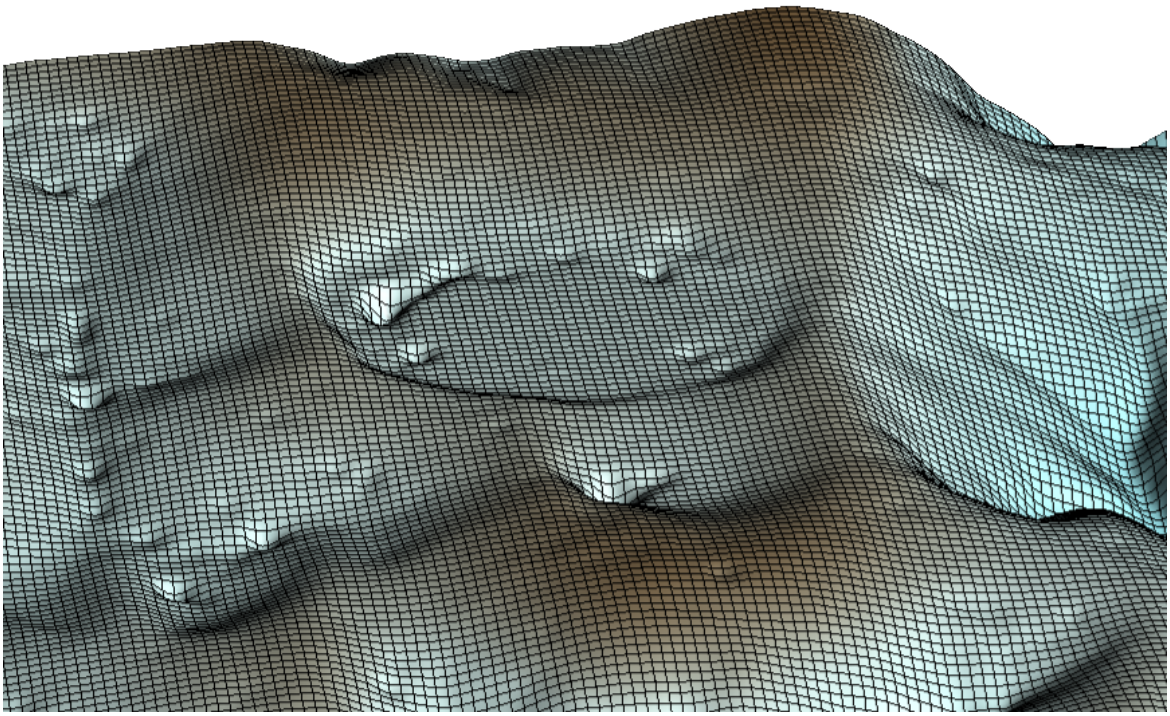

Fig. 5. The Sausthal doublet crater; Digital Terrain Model DGM 25. 3D surface.

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. 6), which is especially expressed in the profile sections (Fig. 7). The young post-impact lake deposits hide a central elevation detected after geophysical measurements (Fig. 8). 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. 9). map. View to the east.

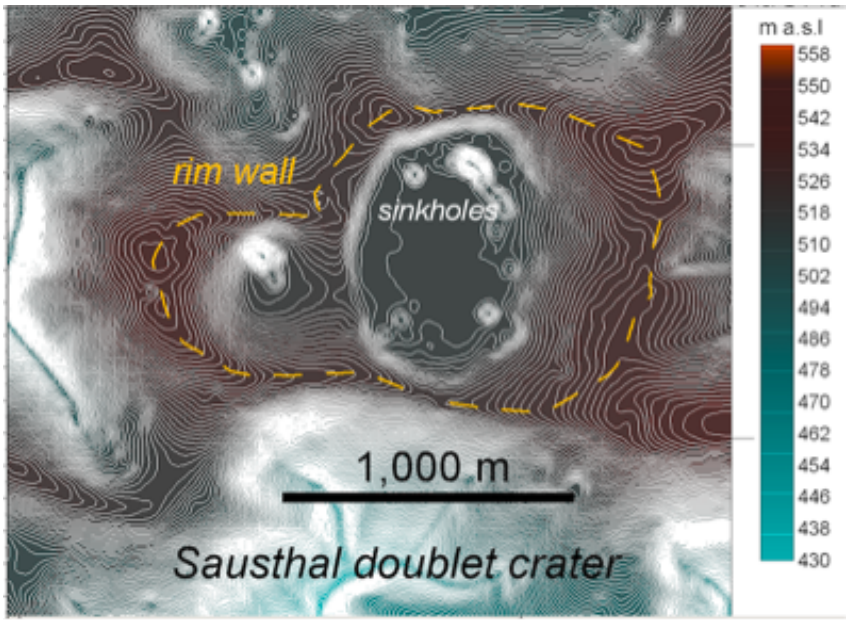

Fig. 6. Topgraphic map of the Sausthal doublet impact crater exhibiting a distincr rim wall. Digital Terrain Model DGM 25, contour interval 0.4 m.

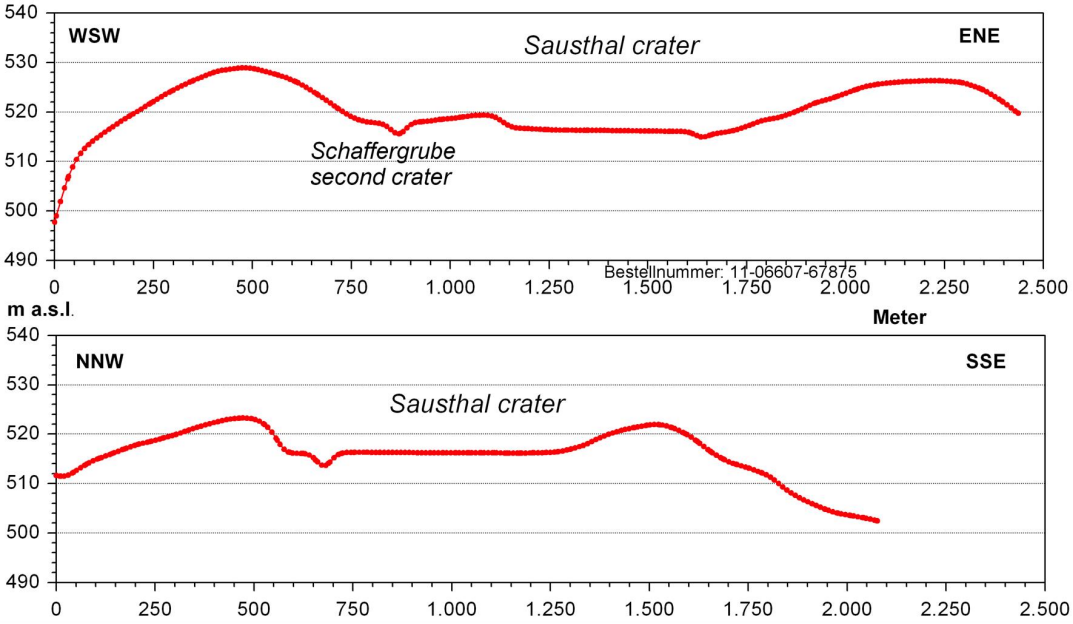

Fig. 7. Sausthal craters: topographic profiles taken from the DGM.

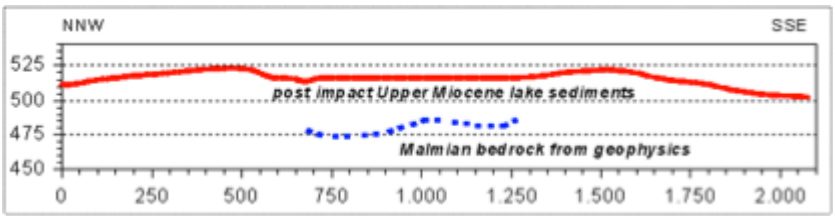

Fig. 8. The NNW-SSE profile with Malmian limestone bedrock sketched from geoelectric measurements [2].

Fig. 9. 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.

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 geoelectrical 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. 9, 10) 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. 10).

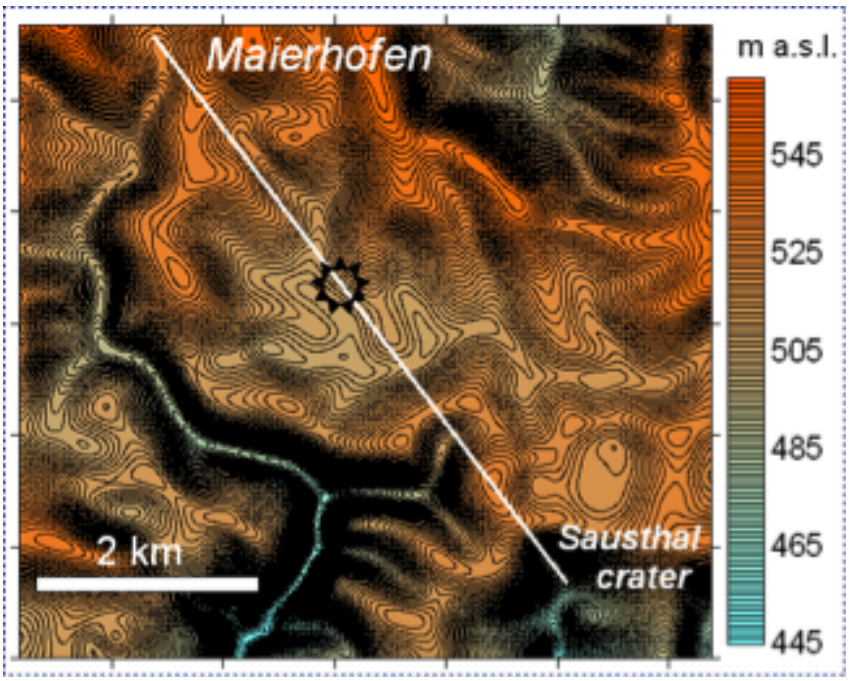

Fig. 9. The circular Maierhofen structure from the DGM 25. Contour intervall 0.5 m.

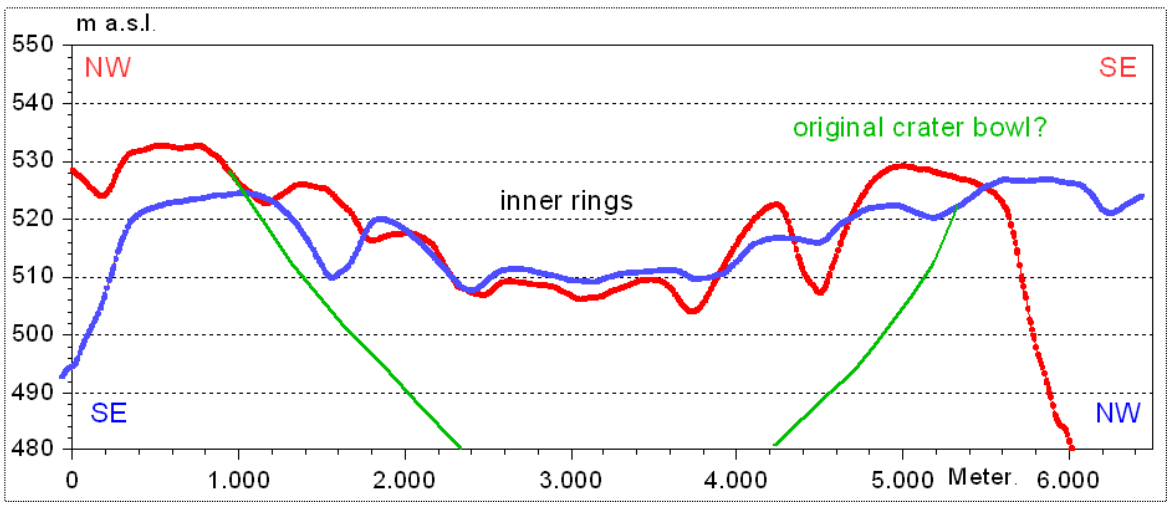

Fig. 10. A topographic profile for the line in Fig. 9. The blue profile is the mirrored red profile, which shows a diametrical symmetry across the structure with the possible existence of inner rings.

Fig. 10. Abandoned quarry in Malmian limestones 3 km west of the Maierhofen structure. The peculiar destructions exclude tectonics and karstification. Recent photo. Another contribution to this LPSC conference about the Mandlberg quarry and eye-opening ground penetrating radar (GPR) measurements of the impact event can be clicked here.. (https://www.hou.usra.edu/meetings/lpsc2021/pdf/1347.pdf)

QUESTIONABLE IMPACTS - DISCUSSION AND CONCLUSIONS

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. 11). 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. 11).

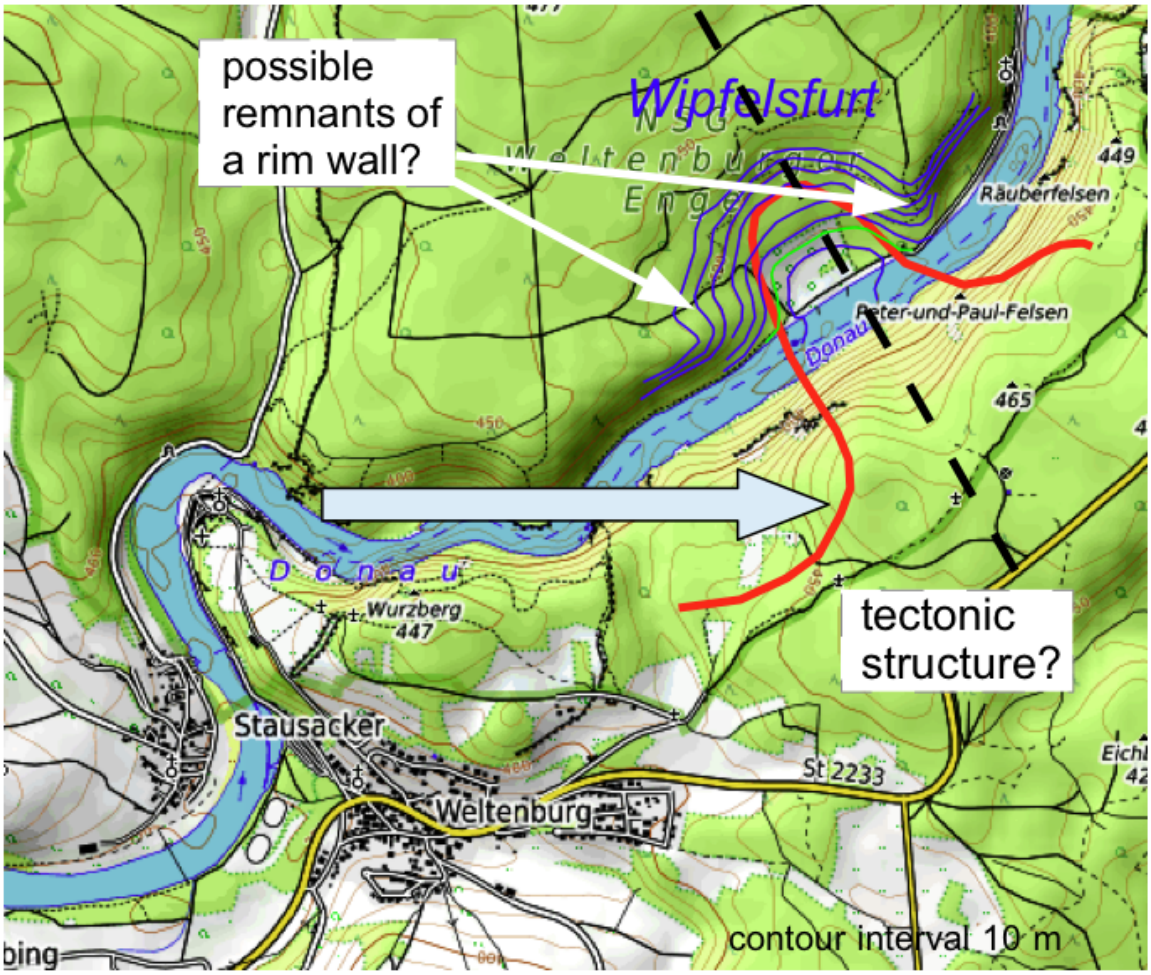

Fig. 12. The Wipfelsfurt crater at the Danube with arguments against an impact nature (see text). OpenTopMap, contour interval 10 m.

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 rather doubtful.

Discussion and conclusions

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, no rethinking has taken place in Bavarian geology, but on the contrary, the old, partly absurd counter-arguments are repeated. 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 weathering formations 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 [xy], 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, reject the equally absurd explanations of the critics as karst hollow formations into the realm of the fable. With this extensive research on the formation of 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 (https://www.hou.usra.edu/meetings/lpsc2019/pdf/1370.pdf), 1370.pdf; [4] Eichhorn, R. et al. (2012) Nicht von dieser Welt - Bayerns Meteorite (LFU, ed.), 126 p.;