THE ENIGMATIC SACHSENDORF BAY STRUCTURE (ODERBRUCH, NORTHEAST GERMANY): EVIDENCE OF A PLEISTOCENE/HOLOCENE METEORITE IMPACT EVENT K. Ernstson[1], J. Poßekel[2] and J. Kurtz[3], [1]University of Würzburg, D-97074 Würzburg, Germany, kernstson@ernstson.de [2]Geophysik Poßekel Mülheim, Germany, jens.possekel@cityweb.de, [3]Kreuzweg 7, D-15326 Podelzig, Germany, tauthob@hotmail.de.

Introduction: A situation that has been controversial and problematic for geologists as an alien element for a very long time exists in northern Germany on the border with Poland (Fig. 1) with an extremely unusual geomorphological feature that is linked to the very conflicting explanatory models of tectonic origin or glacial formation. These basically unsatisfactory explanations were contrasted about a decade ago with a model that attributed the particular structural features to a major Pleistocene or Holocene impact event. The model, which was proposed by a local researcher extremely familiar with the area (the present author J.K.), had many and clever approaches and basically plausible rebuttals against tectonic and glacial models, was published on the Internet [1], but was not further noted by the established geology. Here we report on a new approach to the impact model that was recently made when the tremendous possibilities of the Digital Terrain Model (DTM) were recognized and used. A detailed description of the topographic, geomorphologic and geologic situation and the impact hypothesis derived from it is discussed in [1]. Here, on the other hand, only the important new findings, which have resulted with the DTM and generally from impact research, are presented in the form of an abstract.

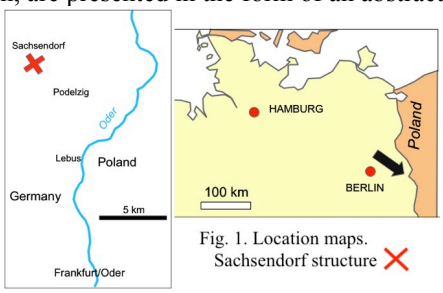

Fig. 1. Location maps. Sachsendorf structure ✕

The Digital Terrain Model (DTM): The DTM is available and has been used in this study in highest resolution with a 1 m grid and a vertical resolution of 10 - 20 cm (DGM 1 in Germany.

The Sachsendorf topographic bay structure: The Oderbruch is an area almost 60 km long and 12 to 20 km wide through which the Oder river flows, and which lies significantly lower than its surroundings. The southern end of the Oderbruch is also called Sachsendorf Bay. The name results from the view, which offers in a view from the adjacent highland into the plain. Here, the Oderbruch is framed in a wide arc by the steeply rising highland edge (Fig. 2). This gives the impression of a bay, although currently without water.

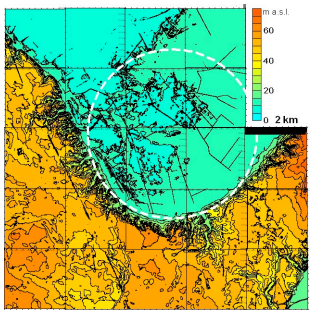

Fig. 2. DTM of the Sachsendorf topographic bay in the southern part of the Oderbruch landscape. Contour interval 5 m. Size of each tile 2 km; tile coordinates x= 1-5, y=1-5. The circle marks the outline of the originally proposed impact structure [1].Note the extremely steep semi-circular drop-off at the edge of the bay with an about 40 m drop.

Geology: The geology, which is in more detail described in [1], comprises Pleistocene and Holocene sediments roughly designed in Fig. 3 and dating the postulated impact event to this time.

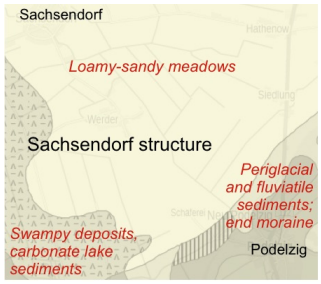

Fig.3. Geologic map of the Sachsendorf structure. Modified from the geologic map 1:300,000 of Brandenburg.

The Oderbruch rim slope. The edge of the slope, where the plateau drops steeply into the Sachsendorf Bay, is strongly dissected (Figs. 2, 4). How these valleys were formed is still controversially discussed among geologists today, mostly focusing on the glacial solution. With the new high-resolution data of the DTM, which were not available to the previous investigations and discussions, a picture emerges, which largely rejects both, the tectonic and the glacial origin, and strongly argues for the impact model. Exactly this was already formulated in [1] as a correct step in the direction of an impact genesis.

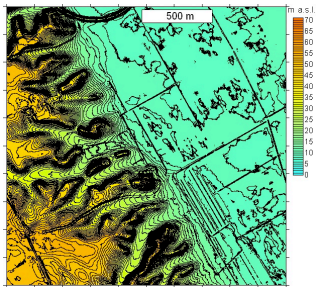

Fig. 4. Tile map x = 2, y = 3 in zoom. Contour interval 1 m. Note the periodic valley incision into diagonally staggered blocks with partially parallelogram-like shape.

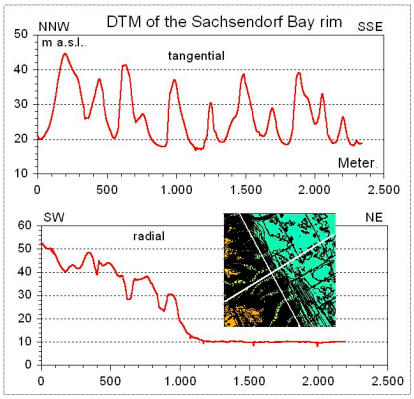

Fig. 5. Radial and tangential DTM profiles across the rim of the Sachsendorf Bay (Fig. 4).

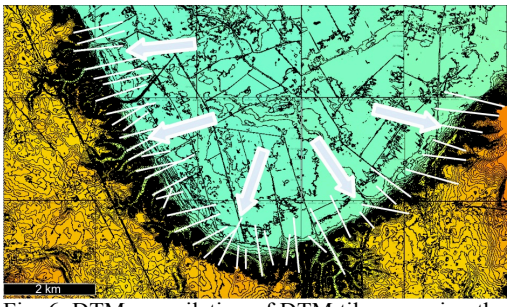

Fig. 6. DTM compilation of DTM tiles covering the southern part of the Sachsendorf Bay rim. The most prominent valley incisions cutting into the rim are marked. Arrows mark groups of incisions of more or less consistent strike directions diverging from a roughly central location. A model of strike-slip transpression and transtension is discussed below.

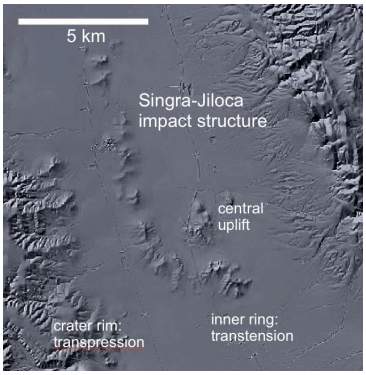

Fig. 7. Transpression and transtension ridges interpreted for the Singra-Jiloca impact structure in Spain [2]. These strike-slip structures have been suggested in [3] to occur in impact structures.

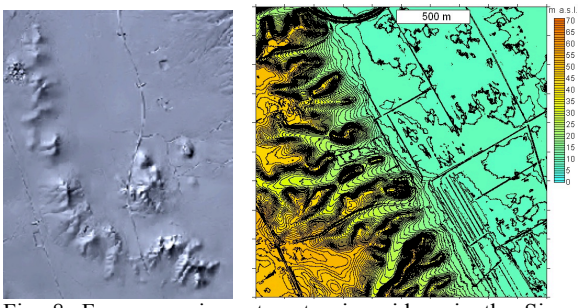

Fig. 8. For comparison: transtension ridges in the Singra-Jiloca impact structure (from Fig. 7) reminding of the rim morphology of the Sachsendorf Bay.

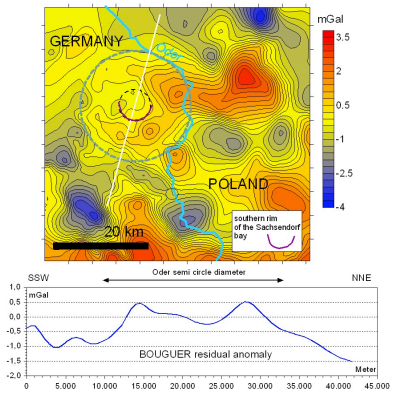

Fig. 8. Gravity Bouguer residual anomaly and profile of the investigated region. Gravity map 1 : 1,000,000 of Germany and neighboring Poland after digitizing and subtraction of a simple regional trend field. Note the Oder semi-circle concentric to the Sachsendorf Bay. - Because of the scale and large station spacing details and data processing results must not be overinterpreted.

Discussion and conclusions: The arguments for the probable Sachsendorf Bay impact in northeastern Germany are listed here: The morphological analysis of the Sachsendorf Bay fully confirms the correctness of the model originally established by J.K. [1]. # The almost strictly periodic enormous valley furrows at the steeply rising edge of the bay, which - bundled - converge in the center of the assumed Sachsendorf crater structure, are incompatible with a tectonic or glacial origin. # J.K.'s original reference to dynamic processes of an impact finds confirmation in comparison with strike-slip processes of transpression and transtension generally in impact structures as a result of radial constriction and widening movements. # The semi-structure of the bay crater has already been pointed out and explained by J.K. Young Pleistocene/Holocene semi-impact craters in soft targets have also been described recently in Germany (Chiemgau impact, Aiching crater, [4], and Saarland impact (Nalbach crater, Saarlouis crater, [5, 6]) as a result of massive erosion. # The possibility of a big multiple impact [1] with extension northward and eastward toward Poland continues to be explored.

References: [1] Kurtz, J. (2012) https://vdocuments.net/meteoritpdf.html. [2] Ernstson, K. and Claudin, F. (2020) http://www.impact-structures.com/2020/6/new-article-jiloca-graben-and-rubielos-de-la-cerida-impact-basin-ne-spain. [3] Kenkmann, T. and Dalwigk, I. v. (2000) Meteoritics & Planet. Sci., 35, 1189-1201. [4] Ernstson, K. and Poßekel, J. (2020) https://agu2020fallmeeting-agu.ipostersessions.com/?s=EF-E1-3-48-F6-1F-59-AF-56-E4-59-E3-0D-8E-DF-F8. [5] Berger, N. et al. (2015) 46th LPSC, 1255.pdf, [6] Ernstson, K. et al. (2013) 76th Annual Meteoritical Society Meeting, 5058.pdf.