IMPACT MELT ROCKS, SHOCK METAMORPHISM, AND STRUCTURAL FEATURES IN THE RUBIELOS DE LA CÉRIDA STRUCTURE, SPAIN: EVIDENCE OF A COMPANION TO THE AZUARA IMPACT STRUCTURE

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About 50 km south of the Azuara impact structure (35 - 40 km diameter; Fig.1) [1, 2], the Rubielos de la Cérida structure is defined by a circular to elliptical basin with a diameter of roughly 40 km, a circular central uplift with a diameter of about 15 km and a 500 m stratigraphic uplift, and a geometrically associated drainage pattern (Fig.5). The most significant feature is the enormous compressive signature in the rocks including gries brecciation [3] (Fig.9) and continuous megabrecciation up to chaotic crisis-cross layering nearly everywhere (Fig.10, 11). Apart from the general megabrecciation, all kinds of monomict and polymict breccias (Fig.8) and breccia dikes (Fig.6) occur. Strong evidence for an impact origin of the Rubielos de la Cérida structure is given by the find of compact melt rocks within the structure between the central uplift and the northern rim. The melt rocks (silicate, carbonate, and phosphate melt) occur as blocks of variable size intermixed in a polymict megabreccia (Fig.2, 3). A petrographic description of these melts is given in [4]. More evidence of impact signature in rocks from the Rubielos de la Cérida structure is given by the occurrence of shock metamorphism. We observe heavily disintegrated feldspars with strong mechanical twinning and multiple sets of PDFs, crossing sets of isotropic lamellae in twinned feldspars, diaplectic quartz and feldspar together with multiple sets of PDFs (Fig.4). Kinkbanding in mica from silicate Creataceous rocks and strong microwinning in calcite are frequently observed. As a macroscopic shock feature, shatter cones can be found in Palaeozoic siltstones near Olalla. A peculiar shock phenomenon in Triassic Buntsandstein conglomerates surrounding the Rubielos de la Cérida structure is described in [5, 6]. An extended blanket of diamicites with strongly plastically deformed components, similar to the Pelarda Fm. ejecta of the Azuara impact structure [7], surrounds the Rubielos de la Cérida structure and is spectacularly exposed at the Puerto Mínguez [8].

Conclusions. Based on current knowledge of impact cratering and impact structures, we conclude from the observations and features summarized here that Rubielos de la Cérida is an impact structure. This established, the neighbourhood to the Azuara structure and the stratigraphic age (Lower to Mid-Tertiary) of both structures makes a synchronous impact of a paired projectile very probable hence constituting the largest presently known terrestrial doublet impact structure.