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**IMPLICATIONS FOR EJECTA BLANKETS ON MARS FROM THE RIES AND CHICXULUB IMPACT STRUCTURES.** F. Schönian[1], T. Kenkmann[1]. [1]Museum of Natural History, Invalidenstr. 43, D-10115 Berlin, Germany. frank.schoenian@museum.hu-berlin.de, thomas.kenkmann@museum.hu-berlin.de

**Introduction:** The large run-out and the surface properties of Martian ejecta blankets resulted in a long-lasting debate on the role of atmospheres and target volatiles in the impact cratering process [1]. These features have either been attributed to a high-density surface flow enhanced by water or molten ice [2] or to atmospheric turbulences [3,4]. Well preserved craters on Earth provide a ground truth to test the models of ejecta blanket fluidization. We report field results from Ries and Chicxulub, which might represent analogues for craters on Mars.

**Ries crater, Germany (26 km Ø):** The Ries ejecta blanket (Bunte Breccia), preserved up to 3 crater radii from the impact center to the S and SE, rests with a sharp contact upon the underlying target rocks. Subhorizontal and bedding-parallel shear planes (detachments) have been observed within these rheologically stratified target rocks (Malmian limestones with thin marly interlayers) beneath the Bunte Breccia at 0.9 to 1.8 crater radii [5]. Striations on detachment surfaces indicate a radial outward motion of the hangingwall. Field analysis and numerical simulations [5] show that their formation is caused by weak spallation and subsequent dragging during deposition of the ejecta curtain.

**Chicxulub crater, Mexico (180 km Ø):** The Chicxulub ejecta blanket was identified on the SE' Yucatán peninsula at 3 to >5 crater radii from the impact center [6,7], which is in the upper range for Martian ejecta run-outs [1]. Field mapping combined with remote sensing data revealed, that the ejecta covers a pre-KT Karst relief [8]. Up to 3.4 crater radii the breccias lack larger crater-derived debris and rarely contains blocks >50 cm. Farther S, crystalline fragments, striated clasts, dolomite boulders with matrix coatings, and internal shear planes occur (Fig. 1a). Particle abrasion and abundance of glide planes rise with crater distance and subsurface erosion is significant [8]. Systematic measurement of striated shear planes indicate a deviation from radial-outward movement up to 38° [9].

**Implications for Mars:** Detachment faulting in the periphery of craters underneath the ejecta, as observed at the Ries, may explain lobe-parallel ridges and furrows in the inner layer of DLE and MLE Martian craters. MOLA profiles across the inner ejecta blanket of the 25-km-diameter Tartarus crater of the northern lowlands (37.4°N, 159.1°E) document the deep seated tearing-apart of the ejecta. A model is proposed in which the tensile break-offs of the target may produce graben-like furrows and folding in the front of a detachment leads to the piling-up of ridges above ramps.

The observations from Chicxulub indicate a transition from a non-cohesive to a cohesive, friction-controlled ejecta flow, that was affected by topography. Flow localization along glide planes most likely occurs at decreasing flow rate (Fig. 1b). According to [10] the fluidized flow may be described by Bingham rheology. The transition to cohesive, sheet-like flow corresponds to the yield point of the material. The formation of ramparts might then be due to an imbrication and stacking of discrete ejecta layers as the ejecta finally freezes (Fig. 1b, [9]).

**Summary:** Properties of the ejecta blankets and target rocks of Ries and Chicxulub revealed processes that might be responsible for the distinct inner and outer facies of Martian ejecta blankets. Both, the subsurface dragging beneath the proximal ejecta and the development of the distal ejecta flow, are enhanced by the presence of water. Hence, the results favor the role of subsurface volatiles for the formation of FEB and ramparts on Mars.

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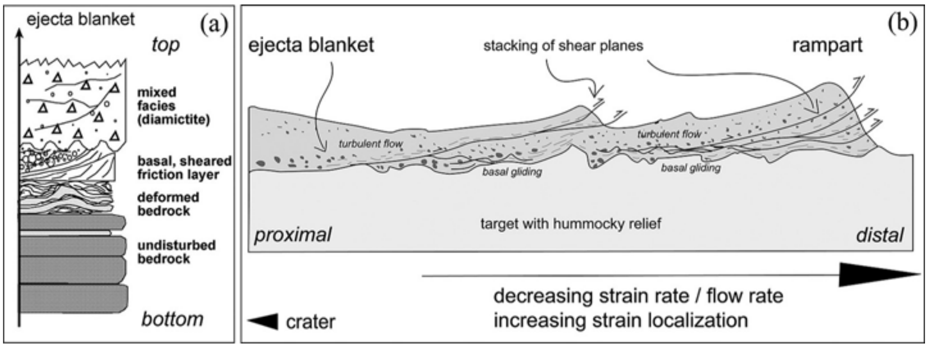


**Figure 1. (a)** Schematic section through the Chicxulub ejecta. **(b)** Model for the formation of FEB and ramparts on Mars.