POST-IMPACT EROSION AND REDEPOSITION OF IMPACTITES AT THE RIES CRATER AND IMPLICATIONS FOR SIMILAR PROCESSES ON MARS. E. Buchner[1,2] and M. Schmieder[1], [1]Institut für Planetologie, Universität Stuttgart, Herdweg 51, 70174 Stuttgart, elmar.buchner@geologie.uni-stuttgart.de, [2]HNU – Hochschule Neu-Ulm, University, Wileystraße 1, 89231 Neu-Ulm.

Introduction: Impact ejecta reworked by various sedimentary processes have been reported from a number of impact structures on Earth [1]. Tsunami-reworked layers of impact glass/spherules and shocked mineral grains at K/P boundary sections associated with the Chicxulub impact structure, Mexico, were described by [2]. At marine impact structures, such as Lockne, Sweden, impact ejecta are commonly reworked within submarine turbiditic 'resurge breccia/arenite' deposits [3]. At impact structures degraded by glacial erosion, e.g., Paasselkä, Finland, glacial float may contain proximal ejecta material [4]. In contrast to the marine and glacial processes mentioned above, impact ejecta reworked by fluvial processes are sparsely mentioned in the literature.

The ~14.5 Ma [5] Nördlinger Ries impact structure in southern Germany is unique in terms of the state of preservation of its ejecta that is conserved as a contiguous blanket surrounding mainly the southern part of the crater. Whereas a great portion of the ejecta is preserved in situ, a certain amount of proximal Ries ejecta material was reworked, fluvially transported and deposited far from its original position. Similarily, distal ejecta were redistributed by Miocene fluvial systems.

Results and Discussion: The rare documentation of fluvially reworked impact ejecta may suggest that shocked mineral grains and impact glasses are unstable when eroded and transported in fluvial systems.

Fluvial reworking of proximal ejecta: Here we report impact ejecta that show sedimentological evidence for at least three steps of high-level fluvial reworking [6]. Well-rounded Ries ejecta material (suevite-derived shocked quartz grains, diaplectic quartz/feldspar glass, and lithic clasts of Bunte Breccia and suevite within multi-generation sandstone pebbles) is distributed within post-impact fluvial sandstones locally known as the 'Monheimer Höhensande'; the latter were carried and deposited within a water distribution network that incised into the eastern part of the Ries ejecta blanket soon after the impact event. Our findings document that shocked quartz grains and diaplectic glass can survive short-range multiple fluvial reworking [6].

A fluvial sediment body at the northern rim of the North Alpine Foreland Basin, locally known as 'Grimmelfingen Formation', consists mainly of coarse-grained fluvial sands ('Graupensande'). [7] reported shocked quartz and other impact-related phenomena in mineral grains and rock fragments ('suevite pebbles') collected from several outcrops of the 'Graupensande'. The sediment body contains material reworked from the Ries ejecta blanket and redeposited within a distance of up to ~150 km from the Ries crater. A prae-impact fluvial structure was probably buried by the impact ejecta and reincised into the southern part of the Ries ejecta blanket soon after the impact event.

Fluvial reworking of distal ejecta: Isolated angular to poorly rounded boulders of Upper Jurassic limestones and some (Middle Jurassic?) mudstone fragments are distributed within fluvial sediments of the Middle to Late Miocene Obere Süßwassermolasse of the North Alpine foreland basin, locally known as 'Reutersche Blöcke' or 'Brockhorizont', respectively. Numerical simulations by [8] suggested that these boulders were ejected during the Ries impact, balistically transported over a distance of up to ~200 km, and subsequently reworked within a fluvial system.

Tektites of the Central European strewn field, distributed within a distance of up to 450 km from the Ries crater that even survived multiple fluvial reworking have been reported from the Czech Republic and from Lusatia (moldavites) [e.g., 6].

Implications for Mars: Soon after the Ries impact event, an initial water distribution network developed in a landscape shaped by the Ries ejecta blanket. Proximal impact ejecta became eroded, transported over considerable distances, and redeposited by local watercourses, in multiple steps. On Mars, the development of initial water distribution networks in impact ejecta blankets can be studied in many cases. The distinct water distribution network that incised the ejecta blanket of the Huygens carter on Mars [e.g., 9] may serve as an analogon to the Nördlinger Ries crater.

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