PLANAR DEFORMATION FEATURES IN QUARTZ GRAINS FROM THE MANSON IMPACT STRUCTURE, IOWA. P. C. Buchanan and C. Koeberl, Institute of Geochemistry, University of Vienna, Althanstrasse 14, A-1090 Vienna, Austria.

The Manson structure is a buried, 36-km diameter meteorite impact crater located in north-central Iowa [1]. Evidence of impact origin includes circular shape, a pronounced central uplift of ~10 km diameter, geophysical anomalies, and planar deformation features (PDFs) in a variety of minerals, including quartz, feldspar, and apatite [1,2]. To delineate the subsurface structure of the Manson crater, twelve boreholes were drilled in 1991-1992; two boreholes previously were drilled in 1953 [1]. Samples of cores from seven of these boreholes (M1, M4, M7, M8, M10, M11, and 2A), which range in location from the center of the structure to 14 km from the center, were analyzed for PDFs in quartz. These samples include basement and supracrustal rocks from the lower levels of some boreholes and various types of breccias from shallower levels. This study was an attempt to extend to other boreholes the work of Short and Gold [2], who reported orientations of PDFs in quartz grains from various levels of boreholes 2A and M1, which are located at distances of 2.5 and 3 km, respectively, from the center of the structure. The purpose of this study was to determine if PDF data could elucidate the spacial distribution of shock pressures that rocks in this impact structure experienced.

As also noted by Short and Gold [2] for their samples, few basal sets of PDFs are present in the rocks analyzed for this study. All of our samples display maxima at ω orientations with variable proportions of π orientations. A few sets of PDFs with normals oriented at angles greater than 35^o to the c-axis are also present. Basement rocks from borehole 2A, which is located 2.5 km from the center of the structure, have a maximum at ω orientations with another small, but significant, maximum at π orientations. In contrast, basement rocks from borehole M8, which is located 5.5 km from the center of the structure, display a maximum at ω orientations without a maximum at π orientations. Supracrustal rocks from below breccias in the M4 borehole, which is located 14 km from the center of the structure, do not provide enough data to be statistically significant. However, they are unusual because they display a high proportion of PDFs with angles greater than 35^o. Breccias from shallow levels in all boreholes display a predominance of ω orientations with or without small maxima in π orientations.

As noted by Short and Gold [2], the degree of shock experienced by samples taken from close to the center of the Manson impact structure was relatively high. Based on the research of Robertson and Grieve [3], the scarcity in quartz grains of PDFs with basal orientations and the predominance of ω and π orientations for all the samples analyzed in this study suggest that these rocks experienced relatively high shock pressures. The presence of a small maximum in π orientations for PDFs in basement rocks from borehole 2A and the absence of a similar maximum in samples of basement rocks from borehole M8 may be the result of a slight decrease in shock pressure with distance from the center of the structure. Orientations of PDFs in quartz grains from breccias in all of the boreholes analyzed in this study are consistent with mixtures of materials that have experienced shock pressures similar to those experienced by basement rocks in boreholes 2A and M8.

Acknowledgment: Supported by the Austrian Fonds zur Förderung der wissenschaftlichen Forschung (project START Y-058).

References: [1] Koeberl C. et al. (1996) *GSA, Spec. Paper, 302*, 145-219. [2] Short N. M. and Gold D. P. (1996) *GSA, Spec. Paper, 302*, 245-265. [3] Robertson P. B. and Grieve R. A. F. (1977) in *Impact and Explosion Cratering* (Roddy D. J. et al., eds.) Pergamon, NY, 687-702