BP AND OASIS IMPACT STRUCTURES, LIBYA, AND THEIR RELATION TO LIBYAN DESERT GLASS: PETROGRAPHY, GEOCHEMISTRY, AND GEOCHRONOLOGY. Begosew Abate[1], Christian Koeberl[1], James R. Underwood, Jr.[2], Edward P. Fisk[3], and R.F. Giegengack[4]. [1]Institute of Geochemistry, University of Vienna, Althanstrasse 14, A-1090 Vienna, Austria (christian.koeberl@univie.ac.at); [2]Department of Geology, Kansas State University, Manhattan, KS 66506-3201, U.S.A.; [3]1026 N 600 E Street, Logan, UT 84341, U.S.A.; [4]Department of Geology, University of Pennsylvania, Philadelphia, PA 19104, U.S.A.

The B.P. impact structure, Libya (at 25° 19' N, 24° 20' E), consists of two eroded and discontinuous rings of hills surrounding a central block, the S half of which is deeply eroded [1]. The inner ring is about 2 km in diameter with an average relief of 30 m, while the outer ring has a diameter of about 2.8 km and a maximum relief of about 20 m. Recent space-shuttle-radar studies show that the structure probably is 3.2 km in diameter [2,3], the outermost disturbed beds being covered by a thin veneer of sand. Rocks exposed are the Cretaceous (?) Nubia Group and include quartz sandstone, siltstone, and conglomerate, with some shocked minerals [4]. The Oasis impact structure, also in Libya (centered at 24° 35' N, 24° 24' E), has a diameter originally determined to be about 11.5 km, but the most prominent part is a central ring of hills, about 5.1 km in diameter and 100 m high. The diameter of Oasis, determined from radar images, now is estimated to be approximately 18 km; as at BP a thin cover of sand obscures the outermost disturbed beds. The structure exposes the same rocks as the B.P. structure (ca. 85 km NNW of Oasis). As with the B.P. structure, its age is only constrained as younger than the target rocks, which are sandstones of the Nubia Group.

Libyan Desert Glass (LDG) is an enigmatic natural glass found in an area of about 6500 km² between sand dunes of the southwestern corner of the Great Sand Sea in western Egypt, near the Libyan border. The glass has a fission track age of 29 Ma [5] and occurs as centimeter to decimeter-sized irregular and strongly wind eroded pieces. It seems likely that this glass formed by impact, but no source crater is known so far. Evidence for an impact origin includes the presence of schlieren and partly digested mineral phases, lechatelierite (a high-temperature mineral melt of quartz), baddeleyite, a high temperature breakdown product of zircon, and the possible existence of a meteoritic component. However, the geographic proximity of the BP and Oasis structures to the LDG site led to the speculation that one of them might be the LDG source. Our geochemical studies provide the first data for such a comparison. We have studied the petrographical characteristics and geochemical composition of 29 samples from the BP and Oasis sites. Petrographic studies on thin sections of the samples showed that they represent mostly submature, moderately to poorly sorted, medium- to fine-grained quartzite sandstone, or quartzitic breccia. Most of the studied samples do not show evidence of shock, but in a few sections some quartz grains with up to 3 sets of shock-characteristic planar deformation features were found. Major element compositions of the samples were determined by XRF and trace element compositions by neutron activation analysis. The results available so far indicate a limited range in composition of all analyzed samples. The average LDG composition is very similar to the composition of some of the BP and Oasis sample compositions, indicating a possible relation. We are currently working on Rb-Sr and Sm-Nd isotope studies that will provide additional constraints for or against such a relation.

Acknowledgments: Supported by the Austrian Academic Exchange Service (to B.A.) and the Austrian Fonds zur Förderung der wissenschaftlichen Forschung (to C.K.). We are grateful to H.C. Cloete, Council of Geoscience, Pretoria, for XRF analyses.

References: [1] A.J. Martin, *Nature* **223**, 940 (1969) [2] J.F. McHone et al., *Meteoritics* **30**, 543 (1995) [3] J.F. McHone et al., *GSA Abstr. w. Progr.* **27(6)**, A-209 (1995) [4] B.M. French, J.R. Underwood, and E.P. Fisk, *Bull. GSA* **85**, 1425 (1974) [5] D. Storzer and G.A. Wagner, *Meteoritics* **12**, 368 (1977) [6] V. E. Barnes and J. R. Underwood, *Earth Planet. Sci. Lett.* **30**, 117 (1976) [7] R. Rocchia et al. *Compt. Rend. Acad. Sci. Paris* **322, IIa,** 839 (1996) [8] C. Koeberl, in preparation (1997)