

**INVESTIGATION OF THE AGOL KUH E CHAH BARGI CIRCULAR STRUCTURE IN SOUTH KHORASAN, IRAN: NO EVIDENCE FOR IMPACT ORIGIN.**

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**Introduction:** Iran has an area of >1.64 million km<sup>2</sup>, yet even though several candidate structures have been investigated recently [1,2], there are to date no confirmed meteorite impact structures in this country. During a deliberate search in 2012, using Google Earth, a 1.5 km diameter ring structure was discovered centred on 32°24'59.5"N, 59°16'11.1"E, 50 km SSE of Birjand, in the eastern Dasht-e Lut desert, South Khorasan Province, eastern Iran. The ring structure, locally named Agol Kuh e Chah Bargi [AKCB], was investigated on 11 May 2014.

**Regional Setting:** The rocks in this region are part of the Sistan suture zone, associated with the collision of the Lut and Helmand (Afghan) blocks. Deformed Palaeocene volcanosedimentary rocks overlie the Cretaceous Birjand ophiolite, and are intruded by Eocene to Oligocene dioritic intrusions [3,4]. AKCB forms a prominent polygonal ring structure, breached in the N, where a wadi issues towards the Kahak playa lake. To the south of AKCB are the Khonik Mts, made of folded Cenozoic rocks.

**Agol Kuh e Chah Bargi structure:** The AKCB structure is a pipe-like intrusion of a light grey, medium grained porphyritic hornblende diorite, with acicular hornblende phenocrysts (and occasional megacrysts up to 1 cm long), which intrudes folded Cenozoic rocks, making up the elevated SW and SE rims. The external ring (fringed by an internal apron of alluvial fans) is severely jointed, with plumose fractures, but there is no brecciation of the diorite. In the interior of the diorite there are zones with two sets of conjugate joints (indicating an E-W  $\sigma_1$ ). Beneath a veneer of desert varnish, the diorite is very fresh, and massive, and completely lacks any small-scale brecciation, or closely-spaced "gries-textured" jointing, such as is characteristic of small impact structures like Ries or Tswaing. A near vertical (87°NW/011 MN) 8 cm-thick dark diorite dyke was found intruding the light diorite. The dyke has magmatic contacts with the main diorite, in which there is a magmatic foliation, defined by preferential alignment of hornblende phenocrysts, which flowed parallel to the dyke contact. There is no indication whatever for any kind of shock metamorphism (breccias, shatter cones, MSJS), and the structure appears undeformed, ruling out an impact origin, but also precluding a suggested caldera collapse origin [3]. Petrographically the AKCB diorite appears identical to diorite of the Givshad intrusion, 32 km to the NW, dated at 39.5±0.6 Ma [4]. The Givshad diorite also has a prominent ridge around it, but it is a flattened oval shape (1.4 x 0.9 km), and not circular. The AKCB and Givshad ring structures seem to have a common origin, perhaps related to differential erosion of a softer volcanic neck surrounded by more resistant country rocks.

**References:** [1] Pourkhorsandi, H. 2013. Abstract #3038, Large Meteorite Impacts and Planetary Evolution V. [2] Dhaneshwar, M. R. M. and Bagherzadeh, A. 2013. *Earth Sci. Inform.* 6:241-252. [3] Khatib, M. M. and Zarrinkoub, M. H. 2009. Abstract #15359, EGU General Assembly, Vienna. [4] Pang, K. -N. et al., 2013. *Lithos* 180-181:234-251.