NON-IMPACT ORIGIN OF THE ARKENU CRATERS (LIBYA). M. Di Martino[1], C. Cigolini[2], L. Orti[3], [1]INAF-Osservatorio Astronomico di Torino, 10025 Pino Torinese, Italy, dimartino@oato.inaf.it, [2]Dipartimento di Scienze Mineralogiche e Petrologiche, Università di Torino, via Valperga Caluso 35, 10125 Torino, Italy, corrado.cigolini@unito.it, [3]Dipartimento di Scienze della Terra, Università di Firenze, via La Pira 4, 50121 Firenze, Italy; letiziaorti@libero.it.

Introduction: A double circular structure, located in S-E Libya about 250 km south of Kufra oasis, was recognized as a double impact crater (the Arkenu craters) by [1], first in satellite imagery and then in the fieldwork, and was thus included in the terrestrial impact crater list. The Arkenu craters consist of an N-E (Arkenu 1) and a S-W structure (Arkenu 2), 10.3 km and 6.8 km in diameter, respectively, whose centers are located about 10 km apart. The interpretation of Arkenu structures as impact-related is based on the observation of shatter cones and impact breccias with planar fractures in quartz grains. We visited the area on November 2007 and we carried out a preliminary geological and structural survey. Our field, petrographic and textural observations do not support the idea that the Arkenu "impact craters" have been originated by the collision of two cosmic bodies. In fact, we did not observe PDF in the collected quartz grains and, in addition, the so called "shatter cones" (brought by Paillou and co-workers as an evidence of an impact event) have been likely produced by the erosion of sandstones (see [2]): all of them, in fact, are oriented in the same direction of the dominant winds (we prefer to name these structures as "pseudo-shatter cones").

Geological Survey: The rocks outcropping in the craters' area are a variety of Paleozoic sandstones and subordinated siltstones. Sandstones on the top of the sequence that also outcrop within the craters, are coarser and carry abundant concretions of diagenetic hematite (millimeters to tens of centimeters in size). These sandstones are well preserved within the Arkenu 2. Conversely, within Arkenu 1 the floor consists essentially of disaggregated portions of these rocks coexisting with massive magnetite deposits. In this case, field evidence and mineral distribution (diagenetic hematite recrystallized as magnetite), suggests digestion of the above sandstones by a subvolcanic intrusive body (now partially outcropping within the crater area). The intrusion is characterized by a mafic precursor, followed by granite locally preserved in the northern sector of the crater. It is suggested that the mafic precursor contributed to the melting of the original sandstone sequence and was then followed by the injection of a granitic magma within the subvolcanic region.

Discussion: We, therefore, suggest the craters forming episode is the result of intrusion of a paired, nearly cylindrical subvolcanic stocks (coupled with ring dike injection in the surroundings) accompanied by hydrothermal degassing. This process was then followed by local structural adjustments, likely due to thermal contraction of the whole edifices along circular fractures. This produced moderate folding and subsidence of the "crater sectors" (currently delimited by the crater rims) as well as the origin of the outer circular structures. Erosion did its cycle and finally revealed the architecture we are now observing.

The present work is part of a more wide study of several circular structures of eastern Sahara and the first results have been recently published [2]. In that contribution we presented our observations on the non-impact origin of the circular structures in the Gilf Kebir area (S-W Egypt), previously identified as an impact crater field [3,4].

References: [1] Paillou Ph., Rosenqvist A., Malezieux J.-M., Reynard B., Farr T. & Heggy E. (2003). Discovery of a double impact crater in Libya: the astrobleme of Arkenu. *Comptes Rendus Geoscience* 335:1059-1069. [2] Orti L., Di Martino M., Morelli M., Cigolini C., Pandeli E., Buzzigoli A., Matassoni L. & Serra R. (2008) *Meteoritics & Plan. Sci.* (in press). [3] Paillou Ph., El-Barkooky A., Barakat A., Malezieux J.-M., Reynard B., Dejax J. & Heggy E. (2004) *Comptes Rendus Geoscience* 336:1491-1500. [4] Paillou Ph., Reynard B., Malezieux J.-M., Dejax J., Heggy E., Rochette P., Reimold W.U., Michel P., Baratoux D., Razin Ph. & Colin J.-P. (2006) *J. African Earth Sci.* 46:281-299.