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Morpho-tectonics and mechanism of emplacement of the andesitic ring in Givshad, east of Iran

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Givshad compersional-sinestral shear zone in south of Baghran mountain range in south of Birjand, east of Iran, is one of the main phenomena that has been important in evolution of magmatism in nothern part of Sistan sutur zone. This zone with north-south active right lateral strike-slip faulting occurs along the eastern margin of the Lut block in the East Iranian mountain ranges, which roughly define the eastern border of Iran. The rocks within the East Iranian ranges define the Sistan Suture zone. This deformed accretionary prism was emplaced during the destruction in late Cretaceous (senomanian) to Paleocene times (89 to 55 Ma) of a narrow arm of Neo-Tethys ocean separating the structurally coherent Lut and Afghan continental blocks. The suture zone is composed of two accretionary prisms (the Neh and Ratuk complexes) separated by sediments and volcanics of the Sefidabeh fore-arc basin. The Neh and Ratuk complexes are identifiably separate structural units, the former dating from late Cretaceous (senomanian) to Eocene times(89 to 34 Ma), and the latter from the pre-Mastrichtian Cretaceous (>71Ma), with different over-all composition and structural histories. The rock units dip steeply, and strike NW_SE. there have been three phases of deformation. The earliest folding event produced E-W trending structures which were subsequently re-folded along NNW trending axial surfaces and dissected by conjugate left- and right-lateral strike-slip faults. These two deformation episodes occurred between the Late Eocene and Early Miocene. The third on-going, deformation event involves N-S right lateral strike slip faulting and associated folding and is probably related to the final closure of Arabia and Eurasia. The Sistan suture zone runs N-S along the eastern margin of Iran. This is a melange of ophiolitic and deep sea rocks. Several apparently active fault strands can be traced running N-S through the suture zone.

The andsitic ring-like structures in Givshad have been a matter of debate for a considerable period of time. However, the mechanism for is emplacement still remains an enigma. A large quantity of geological information, maps, field data have become available over the last 30 years. The Eocene Givshad volcanism intruded into the Paleocene flysch type sediments. These flysch sediments are deposited over an ophiolite mélange sequence in south of Birjand, east of Iran. This ophiolite mélange is introduced as cretaceous sequence. A transperssional tectonic regime case emplacement the oceanic lithosphere segments over continental margin by in upper cretaceous-early tertiary. Some local shear zones with E-W general trends have occurred during emplacement period. Shear zones reactivation happen after Paleocene flysch type sedimentation. These processes have created three different types of deep open spaces. Rhomboid, lensoidal and wedge shape spaces made deep conduits in crustal shear zones.

Two large-size ring-like structures were investigated in Givshad area. The size of ring-like structures are variable and ranges from 1×1.5 km to 0.9×1.2 Km. Based on the field structural data, vertical cross section of maps and morphotectonic evidences these structure aren't ring sill or dykes. They should be collapsed structure of andesitic dome ascending and it looks as a caldera.

The formations of these calderas are classically ascribed to the vertical collapse of the overlying roof during emptying of a shallow magma chamber. This vertical collapse occurs along a ring fault system and leaves a vast, circular and flat-lying depression limited by sub-vertical cliffs that can reach several ten meters high. The walls of ring-like structure have been affected by systematic shear joints. Crossed joints prepare a background for wethering and alteration inside the ring.

Key words: ring-like structures, collapse, Givshad area, morphotectonic, transperssional