

CARBONIFEROUS TO TRIASSIC EVOLUTION OF TUARKYR: FROM INTRA-ARC RIFTING TO FINAL WELDING OF THE "TURAN PLATE"

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Petrographic and sedimentologic data on the Kizilkaya sedimentary succession shed new light on the Late Paleozoic to early Mesozoic geologic evolution of an episutural basin situated within the so-called "Turan Plate", which consists in fact of a complex mosaic of distinct continental microblocks separated by oceanic sutures. In the Kizilkaya structure - which we visited in October 1997 within the Peri-Tehtys Programme - an ophiolitic sequence including pyroxenite, gabbro, pillow basalt and chert, probably representing the oceanic crust of a back-arc or intra-arc basin, is tectonically juxtaposed against a redbed succession documenting penecontemporaneous felsic arc volcanism (Amanbulak Group). The mid-Paleozoic history of the Kara Bogaz and Karakum Blocks is largely unknown and mostly documented by clasts within the Amanbulak terrigenous wedge, because the original sedimentary successions have long been eroded. Plutonic to hypabissal granitoid bodies found both in the Karakum Block and in the Turkmenbasi area are generally ascribed to the mid-Paleozoic, but geochemical data are lacking and radiometric ages are old and few. Even the Upper Paleozoic to Lower Triassic stratigraphic record is preserved only in the Kizilkaya structure, and due to lack of outcrops and limited availability of borehole and seismic data, paleogeographic reconstructions are inevitably very tentative.

We envisage the following major steps in the geologic evolution of Tuarkyr:

- 1) during the late Silurian to Late Devonian (pre-Fammenian), fossiliferous platform carbonates - including carbonate banks with abundant *Amphipora* hydrozoans - accumulated in a nearby area, on tropical shelves facing an oceanic seaway lying north of Paleo-Tethys (Turkestan Ocean);
- 2) convergence and W-ward to NW-ward subduction began at the northwestern margin of the Turkestan Ocean, possibly as a response to accelerated spreading of Paleo-Tethys in the south. Steep W-dipping subduction led to an extensional tectonic regime on the overriding plate. In Tuarkyr, rifting in back-arc or intra-arc settings may have occurred around Late Devonian times, when even the southeastern margin of the East European Craton was undergoing extension;
- 3) during the Early Carboniferous, the Kizilkaya episutural basin deepened and its bottom was mantled by cherty sediments, partly interlayered with pillow basalts;
- 4) around mid-Carboniferous times, closure of several Turkestan seaways took place. The Kara Bogaz and Karakum continental blocks began to collide and portions of oceanic crust were subducted and metamorphosed along the suture zone. Previously emplaced felsic volcanic rocks also underwent low-grade metamorphic recrystallization;
- 5) continuing subduction caused explosive dacite-type volcanism in the Kizilkaya episutural basin, which was rapidly filled by volcanoclastic redbeds (Kizilkaya Formation). Chunks of oceanic lithosphere were exhumed towards the surface during collision with the Karakum Block;

6) collision reached its climax. Closure of oceanic seaways, probably associated with formation of significant relief, caused a marked increase in aridity roughly around the Carboniferous/Permian boundary. Detritus was supplied from cannibalized sedimentary, volcanic and epiplutonic sources (limestone, chert, volcanic arenite, metarhyolite and granophyre clasts) located nearby in the N to NE (Yashmu Formation);

7) after a relatively quiescent stage marked by decreasing grain size of terrigenous detritus (Yashmu Formation), another tectonic and volcanic event is recorded in the overlying conglomeratic succession (Kizildag Formation). Detritus was now derived from sources mainly located in the S and including volcanic to volcanoclastic, sedimentary and metamorphic rocks (volcanic arenite, green lava, chert, carbonate and phyllite clasts);

8) while the source terranes were progressively eroded to their granitoid backbone, as documented by sandstones with partly dissected continental arc provenance, a final explosive stage of rhyolitic volcanism took place (Kizildag Formation). Tuffs and liparitic ignimbrites in fact occur in the Kizilkaya section and were cored both to the west in the Kara Bogaz Block and to the east in Central Karakum. Occurrence of fossil conifers suggests more humid climates;

9) a major unconformity at the base of arkosic braidplain deposits points to continuing tectonic activity and erosion of the plutonic roots of the arc massif around the Permian/Triassic boundary. A further increase in humidity is also indicated;

10) rapid subsidence continued into the Early Triassic. Marine transgressive strata with the endemic Olenekian ammonoid *Dorikranites* are found all around the Caspian region, testifying that Tuarkyr lay not too far from the southern margin of newly-formed Eurasia;

11) final consolidation of the Turan microblock-collage took place with the Eo-Cimmerian Orogeny, when the Peri-Gondwanian blocks were accreted to Eurasia. This event only caused mild deformation in Tuarkyr;

12) after a prolonged period of erosion and weathering, documented by developed of deeply-altered lateritic soil profiles, sedimentation of arkosic siliciclastics - largely derived from erosion of the remnants of Eo-Cimmerian anticlines - resumed in the Middle Jurassic.