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New and revised magnetostratigraphic age constraints on the Akchagylian (late Pliocene) five-fold expansion of the Caspian Sea.

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The late Pliocene Akchagylian transgression in the Caspian Basin led to a five-fold increase of the Caspian Sea surface water, extending the basin to the vast areas of Central Asia, Caucasian foreland (Kura Basin) and the Russian Plate. It also changed the regional climatic conditions by making the Pliocene glaciation milder. Later, establishment of hydrological connection between the Caspian Sea and the global ocean known as the “Akchagylian flooding” enabled active fauna migrations transforming the paleoecology of the region. Despite a relatively well constrained palaeoenvironmental history, the Akchagylian still lacks a univocal age model and two major age constraints exist - the “long” (3.6-1.8 Ma) and the “short” Akchagylian (2.7-2.1 Ma). In this study, we resolve the age contradictions by magnetostratigraphic and ⁴⁰Ar/³⁹Ar dating of several sections in the Kura Basin. With our new data, we further revise magnetostratigraphy and ⁴⁰Ar/³⁹Ar constraints in 25 sections across the Kura Basin and Turkmenistan. We propose a new unified age model for the Akchagylian Stage: 1. Akchagylian transgression at 2.95±0.02 Ma; 2. Caspian-Arctic connection (2.75–2.45 Ma); 3. “Desalinated” Akchagylian between 2.45-2.13 Ma; 4. Akchagylian-Apsheronian boundary at 2.13 Ma correlated to the Reunion subchron (C2r.1n). Our data shows, that magnetostratigraphy requires a careful assessment of sedimentation rates and support from other proxies such as sedimentology, biostratigraphy and radioisotopic dating. The new ages constrain a much shorter (2.95–2.1 Ma) Akchagylian than in previously mentioned regional geological time scales (3.6–1.8 Ma) and strongly appeal to reconsider the ages of numerous archaeological and mammalian sites in the south Caspian region.