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Chronological and structural constraints on the Palaeozoic accretion of the Central Asian Orogenic Belt (CAOB) in SW Mongolia

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The re-evaluation of magmatic, metamorphic and sedimentological records, new isotopic age datasets and detailed structural analysis allow to reconsider the Palaeozoic development of the CAOB in SW Mongolia. The orogen constitution involved discontinuous accretion through the whole Palaeozoic of at least four different terranes separated by active E-W transcurrent faults southward from Early Neoproterozoic continental nucleus. From north to south following sequence is established: 1/ The Lake terrane consists of a Neoproterozoic metamorphic basement overthrust by a Late Proterozoic ophiolitic complex and subduction related HP rocks of early Cambrian 40Ar-39Ar cooling age. 2/ The Gobi-Altay terrane is composed by an Early Palaeozoic metapelite - amphibolite series unconformably overlain by thick volcaniclastic Middle Ordovician to shallow marine or continental Devonian sequence. Arc type intrusions of Late Devonian to Early Carboniferous age intruded the Early Palaeozic crust, producing granodiorite-migmatite dome and LP-HT metamorphism with Early Carboniferous 40Ar-39Ar cooling age. Intra-mountainous Middle to Late Carboniferous basins terminate evolution of both Lake and Gobi-Altay terranes. 3/ The Trans-Altay terrane is a vast Devono-Carboniferous oceanic domain composed of Late Silurian - Early Devonain ophiolitic complexes, Devonian bimodal volcanites and associated volcanosedimentary rocks unconformably covered by Carboniferous thick arc type (andesitic) effusives and volcanosedimentary sequence. 4/ The Gobi Tienshan terrane consists of Late Ordovician - Silurian siliciclastic schists unconformably covered by Devonian to Early Carboniferous volcanosedimentary sequence all intruded by a Late Carboniferous magmatic arc. The following tectonic scenario is proposed: 1/ Early Cambrian obduction of ophiolites and HP rocks reflects the closure of a Palaeoasian ocean during the Early Cambrian. 2/ Subsequent Ordovician to Devonian extension and sedimentation south of the Lake Zone is followed by inversion due to E-W horizontal contraction and arc magmas emplacement at the late Devonian to early Carboniferous. The telescoping cooling and U-Pb zircon ages of synconvergent arc indicate westward docking of this terrane to the Lake Zone promontory as also shown by Namurian intramontaneous basins covering both welded segments. 3/ Formation of a Siluro-Devonian oceanic domain in the Trans-Altay terrane and syn-extensional volcanic and sedimentary activity on the pre-Silurian continental crust of the Gobi-Tienshan terrane are followed by arc type volcanism in the Carboniferous in extensional setting. Thus the generalized Siluro-Devonian extension was replaced by Late Devonian accretion of Gobi-Altay terrane coevally with ongoing extension in the south and southwards migration of volcanic arc activity in future Trans-Altay and Gobi-Tienshan terranes. Late Carboniferous magmatic arc develops on the Gobi-Tienshan continental crust under E-W compressive regime which produces gentle deformation of the Trans-Altay terrane. The entire belt is finally affected by Early Permian to Early Jurassic N-S shortening responsible for final welding of Gobi-Altay with southern terranes. This deformation is pervasive and associated with intraplate magmatism and scarce intracontinetal basins. In conclusion, the CAOB in SW Mongolia was formed by tectonic switching mechanisms marked by three short lived E-W accretionary pulses alternating with long periods of extension above a major subduction zone. This was followed by a major plate reorganization resulting in a huge N-S Permo-Jurassic shortening responsible for E-W geometry of the CAOB and final welding of SW Mongolian terranes.