



The Taili-Yiwulüshan metamorphic core complex corridor: Diachronous exhumation and relationships to the adjacent basins based on new $^{40}\text{Ar}/^{39}\text{Ar}$ and (U-Th-Sm)/He mineral ages

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The Xingcheng-Taili ductile shear zone (western Liaoning Province in China) formed during latest Jurassic to Early Cretaceous crustal extension of the eastern North China craton, and exhumed low to medium metamorphic grade Archean, Upper Triassic and Upper Jurassic granitic rocks. The Mesozoic Yiwulüshan metamorphic core complex (Yiwulüshan MCC) is dominated by a NNE–SSW elongated dome with a left-lateral shear zone, which is located in the northeastern part of Xingcheng-Taili ductile shear zone, and combine as Taili-Yiwulüshan metamorphic core complex corridor. To the east, it is bounded by the NNE-trending Cretaceous to Eocene Liaohe basin (the northern extension of the Bohai Bay basin), and to the west by the Cretaceous-aged Fuxin–Yixian basin, which could potentially interpreted as supra-detachment basins. Here, we present results from a multi-method thermochronological study and coupled with structural investigations and sections of adjacent supra-detachment basins, which constrain the timing of regional deformation as well as the cooling history and exhumation processes of the low-to middle-grade metamorphic complex in the Taili-Yiwulüshan MCC corridor, in order to understand the mode of lithospheric scale reactivation, extension and thinning of the North China craton.

The new $^{40}\text{Ar}/^{39}\text{Ar}$ muscovite, biotite, K-feldspar and (U-Th)/He apatite ages from granitic rocks help constrain the thermal evolution during its exhumation. The thermochronologic studies have shown at least three stages of exhumation and cooling from late Jurassic to Eocene in Xingcheng-Taili shear zone should be distinguished, e.g., ~ 150–130 Ma, 130–115 Ma and 115–52 Ma, respectively. Diachronous onset and subsequent parallel cooling and exhumation characterize the early thermal history. The Yiwulüshan MCC has a similar exhumation history from 135 to 97 Ma with a similar cooling history.

The development of Taili-Yiwulüshan MCC corridor is associated with synkinematic emplacement, exhumation, and volcanic-clastic deposition in the supra-detachment basins. Initiation of the unroofing history resulted from ductile left-lateral shearing since latest Jurassic times. Diachronous onset and subsequent cooling and exhumation characterize the early thermal history. The second and third stages of cooling started lasted until the recently active faulting. Start from the Early Cretaceous the detachment shear zone truncating by the later brittle normal fault. The (U-Th)/He age of 52.3 ± 4.7 Ma indicating final Eocene exhumation of the Taili area is consistent with normal faulting in the Bohai basin area in the east.

Based on the present results and published information, that Cretaceous WNW-ESE extensional deformation and lithosphere thinning in the Taili-Yiwulüshan corridor and throughout the eastern North China craton, the synchronicity of cooling and exhumation of metamorphic core complexes, the formation of supra-detachment basins, and regional alkaline igneous activity reflects Early Cretaceous regional extensional tectonics, possibly resulting from roll-back of the subducted Pacific plate beneath North China Craton.