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Geological control of the eastern Great Wall: mountain-basin relationships in eastern North China Craton

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The eastern Great Wall in China was built by Chinese emperors on Yinshan-Yanshan mountains (in the study area, on the Qinglong pop-up, see below) to protect the inhabitants of China mainland living in the plain to the south of this mountain belt from invading nomadic tribes. This plain is obviously the western extension of the marine Bohai Bay basin. However, which geological processes created this mountain-basin couple?
Relationships between mountains and adjacent syntectonic basins are according to one of these three end member models: (1) extensional (rift) basin flanked by a rift shoulder, (2) compressional basin, a peripheral foreland basin flanked by the overriding thrust sheet, and, a less studied case, (3) uplifted mountains by inflation of large volumes of magmas crystallizing at depth creating an uplifted area. Such a tectonic situation could be created by decratonization driven by subduction of the Paleopacific plate and it was the case in the eastern North China Craton during Mesozoic times. Until now, it is entirely unknown how the distribution of magma bodies controls patterns of surface uplift by inflation, and how the magma distribution within the crust potentially couples of basins and adjacent mountains.
The present study is aimed to resolve the relationship of the eastern Yanshan, here coined as the Qinlong pop-up, along the eastern part of Yanshan orogenic belt, and the basins to the Cretaceous-aged northern margin of the Bohai Bay basin, which area has virtually all these components of potential mountain-basin relationships mentioned above.
The Qinglong pop-up and the Jurassic and Early Cretaceous basins to the south are separated by a WNW–ESE trending fault belt. To the north of Qinglong pop-up, similar basins are located along a ENE-trending strike-slip belt. The Qinlong pop-up includes Jurassic and/or Early Cretaceous granites, whereas mostly Cretaceous volcanic tuffs are found in the adjacent northern and southern basins. From 72 stations in the Qinglong pop-up and adjacent basins, we collected four post-Early Cretaceous deviatoric paleo-stress tensor groups with partly still uncertain relative ages. These include: post-Early Cretaceous ENE–WSW extension (135–100 Ma; Dong et. al, 2007) leading to numerous halfgraben type extensional basins such as the Jiaolai basin and Jixi basin (Zhang et.al, 2004), NNW–SSE strike-slip compression, WSW–ENE strike-slip compression and WNW–ESE strike-slip compression, all events closely related to geodynamics of eastern North China. These events indicate that magma-inflation driven uplifted areas are affected by Early Cretaceous extension and then by mentioned compressional events resulting in thrust inversion of normal faults. This model matches with regional events, such as Xialiaohe basin in the eastern North China Craton. The data shows that extensional conditions dominated during Early Cretaceous, and subsequent stress condition is dominated by compression, e.g. inversion at the Early to Late Cretaceous boundary, then during Late Cretaceous. A final, Early Eocene exhumation event is dated by an apatite fission track age of 47±4 Ma, which is consistent in (U-Th)/He ages in basement rocks further to the east.