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 the 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 Cretaceous to recent Bohai Bay basin. However, which geological processes created this mountain-basin couple?

Relationships between mountains and adjacent syntectonic basins are in accordance to one of the following 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 an inflation of large volumes of magmas crystallizing at depth, creating an uplifted area. Such a tectonic situation could have been created by decratonization, driven by the subduction of the Paleopacific plate and this 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 the surface uplift by an inflation.

The present study is aiming to resolve the relationship of the Qinlong pop-up of the eastern Yanshan to the adjacent basins. The Qinglong pop-up is separated by a conjugate WNW–ESE and ENE-trending fault belts from a Jurassic and Early Cretaceous basin in the south and north. The Qinlong pop-up includes Jurassic (our new $^{207}Pb/^{206}Pb$ ages of 167.3±1.3 Ma and 185.1±4.2 Ma from such granites) 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 the formation of numerous half-graben type extensional basins such as the Chengde basin (Zhao *et.al.*, 2004), NNW–SSE strike-slip compression, WSW–ENE strike-slip compression and WNW–ESE strike-slip compression, all events closely related to the geodynamics of eastern North China. These events indicate that magma-inflation driven uplifted areas are affected by an Early Cretaceous extension and then by mentioned compressional events, resulting in a thrust inversion of normal faults. This model matches with regional events, such as Xialiaohe basin in the eastern North China Craton. Data show that the extensional conditions dominated during Early Cretaceous, and the subsequent stress condition is dominated by a 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.

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