6.4 Tectonic implications

A large number of Early Jurassic arc-like igneous rocks occur in the northeast part of NCC- Korean Peninsula-Hida belt, which belong to the middle-high K calc-alkaline series and are characterized by enrichment in LILE and depletions in HFSE (Wu et al., 2007; Tang et al., 2018 and references therein). In addition, the Early Jurassic accretionary complexes in the eastern margin of the Eurasian continent and the Japan islands, such as the Heilongjiang complex, the Khabarovsk complex and the Mino-Tamba complex, are considered to be related to subduction (Wu et al., 2007; Tang et al., 2018 and references therein). It is generally accepted that the Paleo-Pacific slab subducted westwards in the Early Jurassic (Tang et al., 2018; Zhu and Xu, 2018).

In the middle-late Jurassic, I-type granites are dominant in the Liaodong Peninsula, such as the Zhoujiapuzi granite (this study), Heigou pluton, Gaoliduntai pluton (Wu et al., 2005a), Waling granite (Yang et al., 2015a) and Wulong granite (Yang et al., 2018). There are not A-type granites, and mantle derived magmatism is extremely rare. These granites were formed by partial melting of crustal materials without obvious contribution of mantle derived magma (Wu et al., 2005a; Yang et al., 2015b, 2018; Xue et al., 2020). In addition, WNW-ESE compression during 157-143 Ma was widespread in the Liaodong Peninsula (Yang et al., 2004; Zhang et al., 2020). It not only mylonitized the granite plutons in middle-lower crust levels, but also intensely deformed the thick sedimentary cover in the upper crust (Qiu et al., 2018; Ren et al., 2020). The high Sr/Y signature of Jurassic granites in Liaodong Peninsula do not

necessarily require crustal thickening, as mentioned before. However, based on the evidence of Cretaceous magmatism and core complexes, the Liaodong Peninsula experienced lithospheric thinning and destruction after Jurassic (Yang et al., 2007; Lin et al., 2011). Given the present crustal thickness in the region is ~30 km, the pre-Cretaceous thickness was 45-60 km – equivalent to a surface elevation of ~2–4 km, given conventional isostasy. This is also consistent with the idea that much of eastern China was a high orogenic plateau during the Mesozoic (Meng, 2003; Chu et al., 2020). Hence, Late Jurassic magmatism in the Liaodong peninsula is most likely to be related to subduction of the Paleo-Pacific plate in a mature continental arc, with crust previously thickened by compressional tectonics, related to both the oceanic subduction and the earlier Mesozoic collisions at the north and south margins of the NCC. This setting would produce the conditions required for extensive crustal melting of pre-existing basement. There is a potential resemblance to the modern arc of the Central Andes (Allmendinger et al., 1997), where crustal thickening and plateau growth has developed over the Cenozoic (Scott et al., 2018), and melting of older basement has taken place during subduction of the Nazca plate (Miller and Harris, 1989).