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冀北太古代花岗质片麻岩的成因

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摘要:

冀北是华北克拉通早前寒武纪变质基底的主要出露地区之一。分布于承德-滦平和赤城-张家口地区的新太古代花岗质片麻岩主要由英云闪长岩、奥长花岗岩、花岗闪长岩和二长花岗岩(TTGM)组成,构成了低钾、中钾和高钾钙碱性三个岩石化学系列。二长花岗质片麻岩的LA-ICP-MS锆石U-Pb和Lu-Hf同位素特征揭示其岩浆结晶年龄为 2509 ± 10 Ma。全岩岩石化学、Sm-Nd同位素和锆石Lu-Hf同位素研究表明:(1)低钾钙碱性系列的岩石形成于拉班玄武质岩石的低度部分熔融;(2)中钾钙碱性系列岩石主要形成于玄武质岩石和杂砂岩的部分熔融,局部存在英云闪长质片麻岩的部分熔融;(3)高钾钙碱性系列的岩石形成于以高钾中酸性火山岩为主要成分的杂砂岩的部分熔融。结合近年来冀北早前寒武纪地质研究成果,这些太古代花岗质片麻岩全岩Sm-Nd同位素和锆石Lu-Hf同位素特征揭示~2.7Ga是本区太古代地壳的主要生长期。在新太古代发生了大规模的火山喷发,火山物质形成后不久发生部分熔融形成花岗质岩浆,接着发生变质、变形作用。这些花岗质片麻岩的形成与南美洲西海岸的构造-岩浆活动特征有类似之处,可能反映了太古代末期冀北地区从活动大陆边缘地壳增生、加厚到弧后伸展转化的动力学背景。

英文摘要:

The northern Hebei Province is one major exposure region of Early Precambrian metamorphic basement of the North China Craton. The Neoarchean granitoid gneisses that distribute at the Chengde-Luanping and Chicheng-Zhangjia kou areas are mainly composed of tonalitic, trondhjemitic, granodioritic and monzogranitic gneisses (TTGM). LA-ICP-MS zircon U-Pb and Lu-Hf isotopic analyses for the monzogranitic gneiss yield a discordant upper intercept age of 2509 ± 10 Ma, reflecting its crystallization age. Combined whole-rock geochemistry and Sm-Nd isotopes with zircon Lu-Hf isotopes, three petrochemical series are recognized: (1) low-K calc-alkaline series produced by low degrees of partial melting of tholeiitic basalts; (2) medium-K calc-alkaline series derived mainly from partial melting of basalts and greywackes, with local melting of tonalitic gneisses; (3) high-K calc-alkaline series produced by partial melting of greywackes consisting chiefly of high-K intermediate to acid volcanic rocks. Integrated with recently Early Precambrian study in the northern Hebei Province, the petrogenesis of these granitic gneisses reveals an important Archean crust growth at ca. 2.7Ga in the northern Hebei Province. Large scale of volcanic eruptions occurred at the Early Noearechean, which constructed the protoliths of these granitic gneisses, and subsequently partial melting of these volcanic and related volcanic sedimentary rocks produced the magmas of TTGM, followed by regional metamorphism and deformation. The geodynamic processes producing these Neoarchean granitic gneisses suggest that their tectonic background are analogous to the west coast of the South America, implying a transitional geodynamic regime from convergent compression to back-arc extension in the northern Hebei Province.

关键词: [新太古代](#) [花岗质岩石系列](#) [锆石U-Pb年龄](#) [岩石成因](#) [动力学背景](#) [冀北地区](#)

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