Tectonic characterization of North Indian continental margin: Constraints from the geochemical and SHRIMP U-Pb zircon geochronological analysis of Wangtu Gneissic Complex (WGC), Lesser Himalaya-Higher Himalaya interface

HIFZURRAHMAN[*1], P NASIPURI[1]

[1]Indian Institute of Science Education and Research-Bhopal (* correspondence: hifzurrahman17@iiserb.ac.in, pritam@iiserb.ac.in)

A part of Paleoproterozoic granite-gneiss complex, commonly known as Wangtu Gneissic Complex (WGC), is exposed in the Wangtu-Karcham-Akpa region along the Sutlej valley, Northwest Himalaya, Himachal Pradesh. In the central part of WGC, the dominant rock type is granite, that grade to granite-gneiss towards the tectonic contacts with Higher Himalaya.

K-feldspar □– plagioclase (X_{An}=0.3-0.25) □– biotite (X_{Mg}=0.35-0.45) – muscovite ± hornblende constitutes the WGC. In most of the samples, the SiO_2 and Al_2O_3 content varies between 69- 74 wt% and 13-16 wt%, respectively. The CaO, Na_2O, and K_2O vary between 0-2 wt.%, 1-3 wt%, 4-7 wt.% respectively, and are classified as peraluminous granite. The low CaO content, in contrast to the relatively higher K_2O/Na_2O (2.21 to 4.5 wt. %) content, enrichment of K, Rb, Ba, Sr, Th, and U imply sediment sources for these granites. NCKFMASH phase topology, coupled with isopleth thermobarometry, implies K-feldspar – plagioclase – biotite stabilized at temperature 550-600°C, pressure 0.6-0.8 GPa. A nearly similar temperature, i.e., 550-600°C, is obtained by using the empirical formulation involving Ti solubility in biotite. Around ~ 150-300 μm-sized euhedral to subhedral magmatic zircons (aspect ratio from 2:1 to 4:1) occur as inclusion within the K-feldspar and plagioclase grains.

Zircons are oscillatory zoned. The U-Pb upper intercept ages from the marginal part concentrate between 1800-1900 Ma. These obtained ages (1800 to 1900 Ma) from magmatic zircons implies, that the north Indian continental margin was an active subduction zone during the formation of Columbia supercontinent which leads to the generation of magma parental to WGC. The distinct zircon cores exhibit an upper U-Pb intercept age of 2460±20 Ma, which may experience the recycling of older crust and Late Neoarchean-Paleoproterozoic sources.