

# **Geochemistry and U-Pb zircon geochronology of Jutogh metasediments, Lesser Himalaya, India, and their implications in Columbia reconstruction**

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The tectonic characterization of the northern margin of the Indian Peninsula during the Paleoproterozoic supercontinent assembly is debatable. Here we report the results of the geochemical and geochronological studies of the Jutogh metasedimentary rocks that occur as a tectonic window between the Lesser and the Higher Himalaya. The Jutogh Group of rocks are mostly mica-schists and variably metamorphosed. The weathering intensity parameters, such as chemical index of alteration (CIA), plagioclase index of alteration (PIA), and index of compositional variability (ICV), range from 81 to 65 (mean = 72), 97 to 68 (mean = 84), and 1.9 to 0.6 (mean = 1.2), respectively indicating low to moderate degrees of weathering. Transition element ratios [Ni/Co (6.98 to 2.88), and V/Ni (2.32 to 1.27)], and major and trace element geochemistry imply recycled, felsic to intermediate, Archean to post-Archean sources for the sediment parental to the Jutogh rocks. The tectonic discrimination diagram implies an active continental margin setting for the deposition of the Jutogh metasediments.

Zircons found in Paragneiss rock range from 100  $\mu\text{m}$  to 250  $\mu\text{m}$  and have an aspect ratio of 2:1 to 4:1. Zircon internal structure varies from concentric U-Th zonation implying magmatic zircons ( $\text{Th}/\text{U} \geq 0.1$ ) to diffused U-Th zonation, irregular patchy domains, suggesting recrystallization and metamorphism of older zircon grains ( $\text{Th}/\text{U} \leq 0.1$ ). Apart from a few zircon grains with a  $^{207}\text{Pb}/^{206}\text{Pb}$  age  $> 2000$  Ma, the weighted mean  $^{207}\text{Pb}/^{206}\text{Pb}$  age of high Th/U ( $> 0.1$ ) and low Th/U ( $< 0.1$ ) grains are constrained to be between  $1877 \pm 3$  Ma and  $1874 \pm 3$  Ma. On a U-Pb Concordia diagram, the high and low Th/U zircon groups yield upper intercept ages of  $1877 \pm 3$  Ma and  $1873 \pm 8$  Ma, respectively. When combined, the present study from the Jutogh rocks and the S-type Paleoproterozoic granite magmatism suggest the existence of an active tectonic setting during the deposition of the Jutogh sediments along the northern margin of the Indian continent during Columbia assembly.