
Geophysical constraints on the distribution of leucogranites within the Greater Himalayan Crystalline Complex: A new view of the Indepth-I seismic reflection profile

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Résumé

One of the most spectacular characteristics of the India-Asia collision is the widespread occurrence of leucogranites within the Himalaya orogen. There are numerous case studies focusing on the surface exposures of leucogranites, addressing its surface distribution and their associated outcropping structural features. However, the depth extent, volume, the architectural characteristics at depth are topics which are still vague, as well as the emplacement mechanism of such granitic plutons. These are highly debated questions among Earth Scientist working in this collisional orogen. To better characterize leucogranites and associated structural features, here the Indepth-I deep normal incidence seismic reflection profile was reprocessed to image the Tethyan Himalayan Sequence (THS) and Greater Himalayan Crystalline complex (GHC) to a depth of 42 Km. Compared to the previous result, the new images reveal a multicyclic relative high amplitude north-dipping event. This is dominated by northward-dipping and imbricate reflections that are interrupted by weak/transparent zones. Reflections in lower GHC dip northward at a gentle angle and exhibit relatively homogeneous wave patterns. This seismic signature complemented with other geophysics observations suggest that the upper GHC has undergone rapid exhumation along the main discontinuity. Based on obtained images and the geometrical relationship of the overall structure and the surface exposures of the leucogranites, the seismically transparent areas in GHC could be indicative of leucogranitic emplacements. The Himalaya leucogranites are considered to be the product of rapid exhumation of the upper GHC together with magma along High Himalayan Thrust (HHT), repeated in-situ remelting due to strain heating by exhumation of lower GHC and Lesser Himalayan Sequence (LHS), and the extension of the South Tibetan Detachment System (STDS). This mechanism would be consistent with the proposed interpretation of the seismically transparent zones as being the seismic response of leucogranitic plutons.

Mots-Clés: Indepth, I deep seismic reflection profile, leucogranites, Transparent reflection, Himalayan orogeny, High Himalayan Thrust

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