Does the Karakoram fault interrupt mid-crustal channel flow in the western Himalaya?

Mary L Leech

Department of Geosciences, San Francisco State University, San Francisco, CA 94132, USA
E-mail: leech@sfsu.edu

Variations in the volume and age of Miocene granites and in mid-crustal conductance from the northwest Himalaya to southeastern Tibet imply lateral differences in late orogenic processes. The east-west change occurs near Gurla Mandhata dome, where the Karakoram fault terminates and merges with the Indus-Yarlung suture zone. The 'channel flow' model, developed in southeastern Tibet, predicts anatectic partial melts beneath the Tibetan plateau are gravitationally-driven south to a topographic erosional front and are exposed as leucogranites in the Greater Himalaya Sequence; upwellings of these channel granites occur as gneiss domes in the Tethyan Himalaya Sequence. Magnetotelluric profiles show high conductivity 30-40 km deep beneath Tibet from c. 400 km north of the Main Frontal thrust south across the suture zone, beneath the Himalayan gneiss domes, and to the topographic front; this conductive middle crust implies 2-4% partial melt in the northwest Himalaya and 5-12% melt in southeastern Tibet, sufficient in the latter case to weaken rock for flow. East of the Karakoram termination channel granites are abundant and are as young as 7 Ma; west of the termination, channel granites are less abundant and no younger than 18 Ma. Middle Miocene (16-14 Ma) leucogranites are found in the Karakoram shear zone located north of the suture zone and south of the proposed anatectic melt source. The initiation of motion on the crustal-penetrating Karakoram fault at 25-21 Ma may have created a barrier to southward flow of mid-crustal melts and acted as a vertical conduit for these same melts.