GSA Data Repository 2018165

Braden et al., 2018, Renewed late Miocene (<8 Ma) hinterland ductile thrusting, western Nepal Himalaya: Geology, https://doi.org/10.1130/G40097.1.

1. SHRIMP U/Pb Geochronology

Analytical procedures are modified from those described by Stern (1997) with data processing using SQUID2 (version 2.22; Ludwig, 2009). The 6266 zircon was used as the primary calibration standard with $^{206}Pb/^{238}U$ age of 559 Ma (Stern and Amelin). Zircons were cast in 2.5 cm diameter epoxy mounts along with fragments of reference zircons. The mid-sections of the zircons were exposed using 9, 6, and 1 μm diamond compound, and the internal features of the zircons (such as zoning, structures, alteration, etc.) were characterized in back-scattered electron mode (BSE) utilizing a Zeiss Evo 50 scanning electron microscrope. Mount surfaces were coated with 10 nm of high purity Au. Analyses were conducted using an ^{16}O- primary beam projected onto the zircon surface at 10 kV. A 50 m kohler aperture produced a ~9 m analytical spot with a beam current of ca. 1.3 nA. The count rates at ten masses including background were sequentially measured over 5 scans with a single electron multiplier and a pulse counting system with deadtime of 23 ns. The 1s external uncertainty of $^{206}Pb/^{238}U$ ratios reported in the data table incorporate a ±1.0 % error in calibrating the standard zircon (Stern and Amelin, 2003). No fractionation correction was applied to the Pb-isotope data; common Pb correction utilized the Pb composition of the surface blank (Stern, 1997). The uncertainty of the calibration for the mount is 0.36%. Isoplot v. 3.00 (Ludwig, 2003) was used to generate concordia plots and calculate weighted means. The error ellipses on the concordia diagrams, and the weighted mean errors are reported at 2. Analyses of a secondary zircon standard (Fish Canyon tuff) were interspersed between the sample analyses to verify the accuracy of the U-Pb calibration. The weighted mean $^{206}Pb/^{238}U$ age of four SHRIMP analyses of Fish Canyon Tuff zircon was determined to be 28.8 ± 0.5 Ma, within error of the value of 28.476 ± 0.029 Ma reported by Schmitz and Bowring (2001).

Full analytical results and concordia plot (created in Isoplot) are shown in excel spreadsheet Table DR1. Table DR1 has four tabs:
Tab 1 – U, Th, Pb data
Tab 2 – Standard data
Tab 3 – Wetherill concordia plot
Tab 4 – Tera-Wasserburg plot

2. LASS depth profiling U/Pb Geochronology & trace element data

Depth profiles from rim to core of loose-mounted zircon grains was completed at the University of California, Santa Barbara using a Photon Machines 193 nm ArF Excimer laser ablation system connected via split stream to a multi-collector Nu Plasma and an Agilent 7700S Quadrupole inductively-coupled plasma mass spectrometer (LASS-MC-ICPMS). U, Th, Pb, and trace element data were collected simultaneously using a spot size of 25 μm, 225 shots (75 seconds) at a frequency of 3 Hz and 100% of source laser

energy of 3 mJ. Reported ages are ^{207}Pb corrected $^{207}Pb/^{238}U$; all age results reported to 2σ. Zircon standard 91500 (Wiedenbeck et al., 1995) was used with GJ-1 (Jackson et al., 2004) as a secondary standard. Analytical procedures are outlined in Cottle et al. (2013), Kylander-Clark et al. (2013) with modifications described in McKinney et al. (2015). Data reduction was carried out using version 2.1.2 of Iolite (Paton et al., 2010).

The final $^{208}Pb/^{238}U$ age (^{207}Pb corrected) for each depth profile was plotted against the Yb concentration (Fig.DR2) to determine the core and rim separation for each grain. The x axis of the plot is time, i.e. the length of time signal was collected from rim to core of the depth profile. The y axis on the left is the amount of Yb in ppm, displayed on a logarithmic scale. The y axis on the right is the age in Ma. The profiles were divided into segments where the age and trace element data form consistently flat plateaus.

A few (analyses with grain_position label xx_m) grains with a mantle between the outer rim of the grain and the core were analyzed but all data points were discarded as meaningless mixing ages. Data falling along the regression line represent mixing arrays.

Full analytical results including trace element and standard data are shown in excel spreadsheet Table DR2. Table DR2 has one tab with all the U, Th, Pb and trace element data and secondary standard data.

% discordance =
$(1-(^{206}Pb/^{238}UAge/^{207}Pb/^{206}PbAge))*100$

References

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TABLES

2018165_Table DR1.xlsx

2018165_Table DR2.xlsx

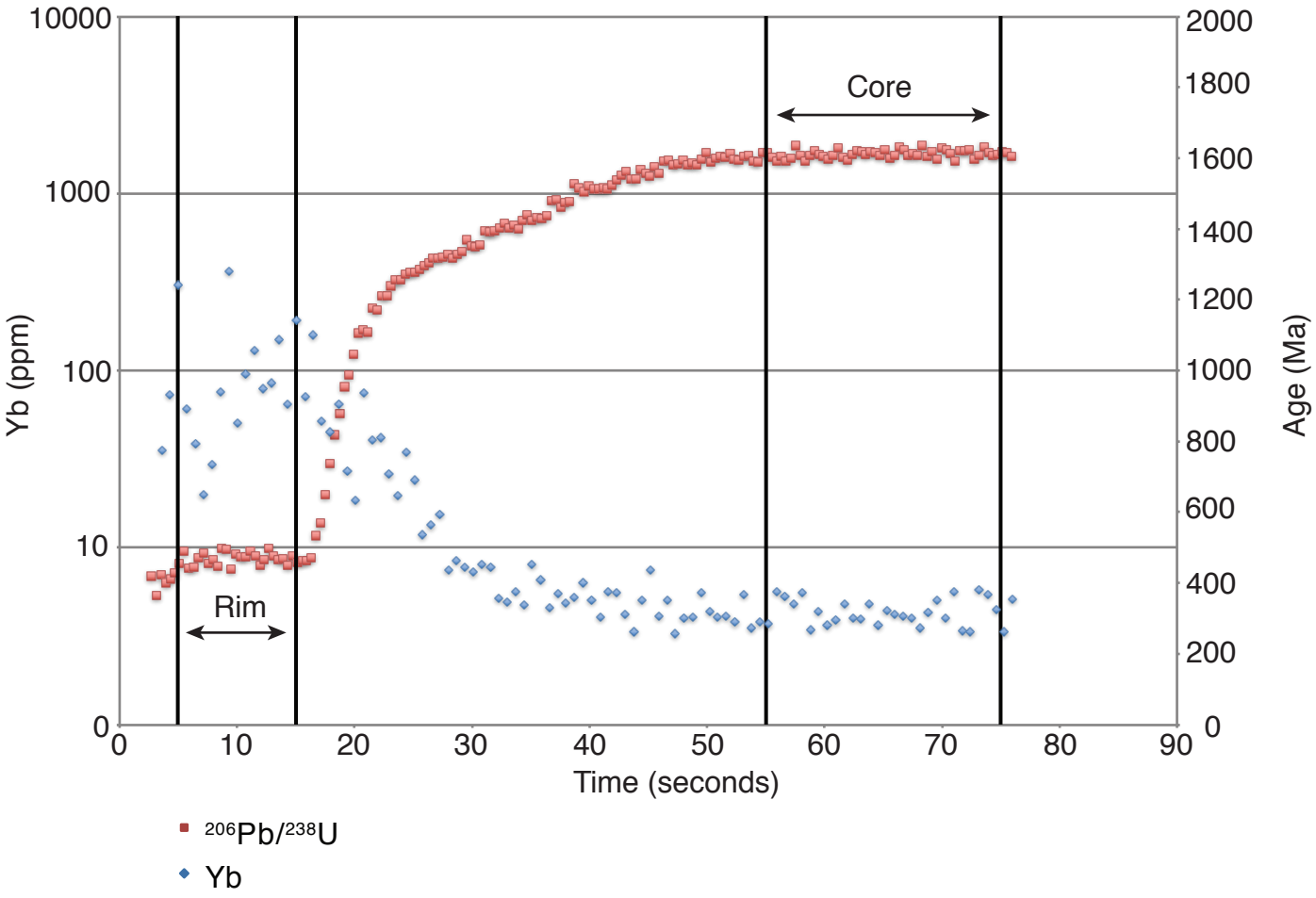

Figure DR2: Example of method for separating the rim and core of zircon grains in depth profile analyses (grain 25).

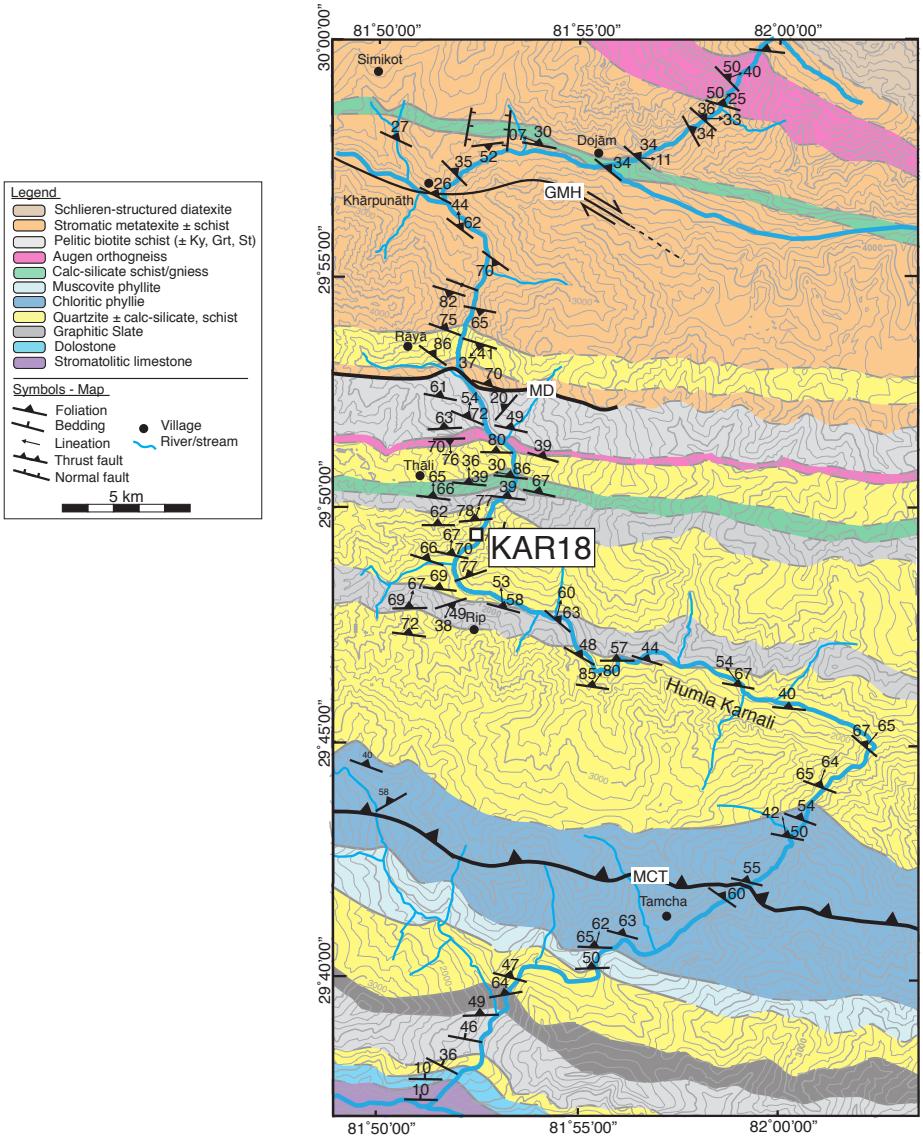

Figure DR3: Geological map of the Karnali valley, modified from Yakymchuk and Godin (2012). Sample KAR18 is identified by a white box on the map. GMH: Gurla Mandhata-Humla, MD: Metamorphic Discontinuity, MCT: Main Central thrust.

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