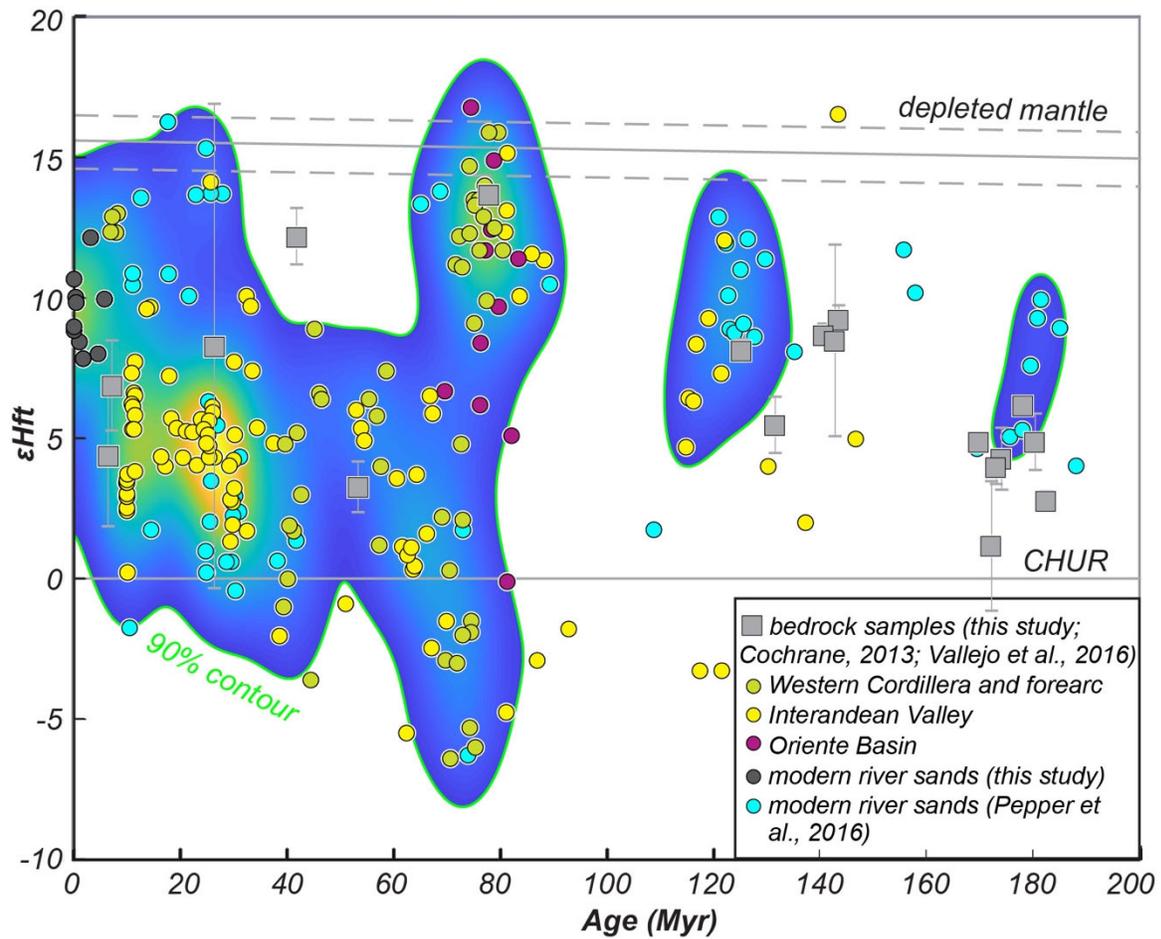


Zircon U-Pb geochronological methods

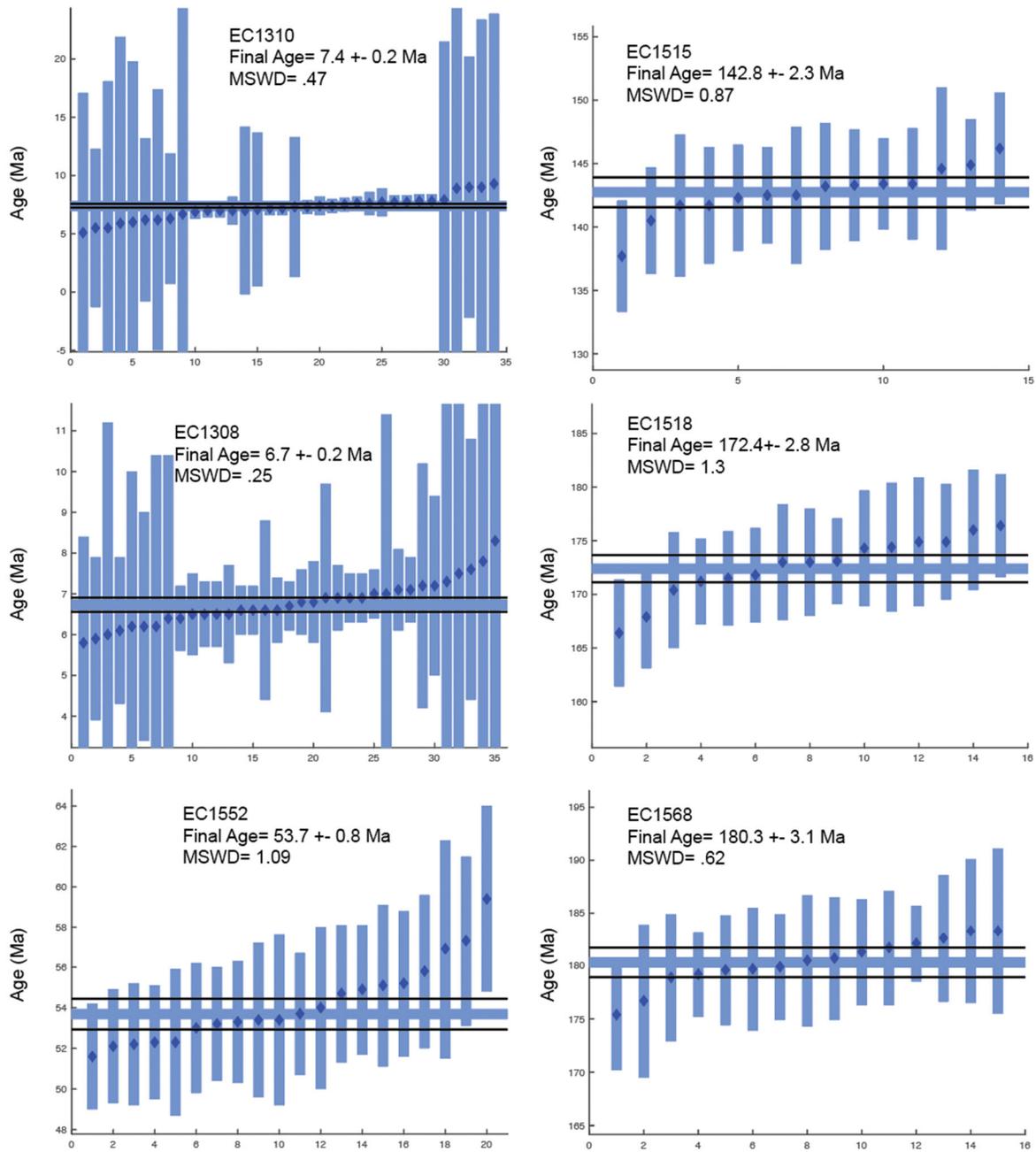
Samples were crushed and zircon grains were extracted using a Wilfley table, heavy liquids, magnetic separations, and a Wig-L-Bug mill. Samples were mounted onto epoxy pucks with Sri Lanka, FC-1, and R33 zircon standards and polished to ~20 micron depth such that grain interiors were exposed. Igneous samples were imaged using cathodoluminescence imaging, and detrital samples were characterized with back scattered electron images. Grains were analyzed using an Element2 HR inductively coupled plasma spectrometer at the University of Arizona LaserChron. A Photon Machines Analyte G2 excimer laser equipped with HelEx ablation ablates a spot diameter of 20 microns. Helium carries the ablated materials to a plasma source in an Element2 HR ICPMS, which sequences rapidly through U, Th, and Pb isotopes. Signal intensities are measured with an SEM that operates in pulse counting mode for signals less than 50K cps, in both pulse-counting and analog mode for signals between 50K and 5M cps, and in analog mode above 5M cps. The calibration between pulse-counting and analog signals is determined line-by-line for signals between 50K and 5M cps, and is applied to >5M cps signals. Four intensities are determined and averaged for each isotope, with dwell times of 0.0052 sec for 202, 0.0075 sec for 204, 0.0202 sec for 206, 0.0284 sec for 207, 0.0026 sec for 208, 0.0026 sec for 232, and 0.0104 sec for 238. With the laser set an energy density of ~5 J/cm², a repetition rate of 8 hz, and an ablation time of 10 seconds, ablation pits are ~12 microns in depth. Sensitivity with these settings is approximately ~5,000 cps/ppm. Each analysis consists of 5 sec on peaks with the laser off (for backgrounds), 10 sec with the laser firing (for peak intensities), and a 20 second delay to purge the previous sample and save files. Data is reduced with an Excel spread sheet (E2agecalc) and a Python code.



Supplemental figure 1. Scatter plot of 200-0 Ma zircon ϵ_{Hf_t} data from detrital samples (circles) and bedrock samples (squares). Detrital samples are separated by tectonomorphic domain and sample type (modern river sand versus sandstone). Bedrock zircon ϵ_{Hf_t} values are shown as the weighted mean of a bedrock sample with 2σ uncertainty. Average 2σ uncertainty for detrital samples in this study is 1.8 ϵ_{Hf_t} units. Detrital data is also plotted as a two-dimensional bivariate kernel density estimate (kernel bandwidths are set to 2ϵ units and 5 Myr) shown as a heat map with a contour 90% from the peak intensity using *HafniumPlotter* (Sundell et al., 2019).



Supplemental figure 2. GoogleEarth image with compilation of igneous ages. In addition to geologic maps of Ecuador, these ages were used to inform the arc positions presented in Figure 1b.



Supplemental figure 3. Weighted averages of zircon U-Pb ages on igneous rocks. Raw data including excluded ages can be found in DR2.