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A ZIRCON PETROCHRONOLOGIC VIEW ON GRANITOIDS AND CONTINENTAL EVOLUTION

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We explore temporal trends in granitoid chemistry and thermometry that could constrain major global changes in style of magmatism and tectonism in the continents. Zircon geochronology and trace element geochemistry on new detrital rocks and a global compilation of published single zircon detrital chronology and trace chemistry add to ~ 6000 individual grains. Zircons of all ages from 4.4 Ga to present exist in this archive. Ti-in-zircon thermometry indicates the great majority of the grains with concordant U-Pb ages formed in the 650-850 °C range consistent with magmatic growth in intermediate to silicic magmas; most of these likely formed intrusive rocks. Temperatures increased over time for the first 1.2 Ga of Earth's history after which they stayed constant before decreasing during the more recent past. U/Th in the overwhelming majority of grains are consistent with a magmatic origin. La/Yb, Sm/Yb and Eu/Eu* values are relatively constant throughout the history of the Earth suggesting that most granitoids formed at or evolved from reservoirs located at depths of 35-45 km in the presence of amphibole, garnet and plagioclase. Such reservoirs are common today in hot deep crustal environments along subduction zones. Processes other than modern day style subduction may have contributed to the formation of granitoids in the early Earth but temperatures, depths and the presence of water arbitrated by the presence of amphibole were similar. These results also suggest that the thickness of continental crust in areas that produced granitoids was similar to today's global average from the Hadean on.