On the first 1.5 billions years of crustal evolution

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It remains difficult to understand the significance of regional case studies in evaluating the composition of new/juvenile continental crust and hence the conditions and tectonic setting(s) under which it was formed, particularly before 3 Ga. Less than 5% of the geological record consists of rocks older than 3 Ga, and there are no known rocks older than 4 Ga. Yet models based on the U-Pb, Hf and O isotope ratios of detrital zircons suggest that at least ~60-70% of the present volume of the continental crust had been generated by 3 Ga. The sedimentary record is biased by preferential sampling of relatively young material in their source terrains. The implication is that there were greater volumes of continental crust in the Archaean than might be inferred from the compositions of detrital zircons and sediments.

The growth of the continental crust was a continuous rather than an episodic process, but the rates of continental growth were significantly higher before 3 Ga than subsequently. There is a strong positive correlation between the Rb/Sr and the SiO_2 content of the crust, and thus the time-integrated $^{87}Rb/^{86}Sr$ ratio can be used as a proxy for the bulk composition of the new continental crust through time. The time-integrated Rb/Sr ratios, and the average SiO_2 contents, indicate that new continental crust was largely mafic over the first 1.5 Ga of Earth's evolution, and that significant volumes of pre-3 Ga crust may have been associated with intraplate magmatism.