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Episodic Growth of Continental Crust and the Balance between rates of Crustal Production and Recycling

K. C. Condie

Department of Earth & Environmental Science, New Mexico Tech, Socorro, NM 87801 USA

Using published SHRIMP and LAM-ICPMS of concordant and near-concordant U/Pb isotopic ages from single zircons from deformed granitoids and volcanics and from detrital zircons populations, together with Nd and Hf isotopic data, it is possible to establish precise episodes of preservation of juvenile continental crust. Some peaks in crustal preservation are not recognized in both igneous and detrital zircon populations, a factor that appears to result from sampling biases. Previously recognized global peaks in juvenile crust preservation at 2.7 and 1.9 Ga can now be resolved into five peaks at 2700, 1885, 1705, 1655 and 1620 Ma. In addition, crustal preservation peaks of widespread significance are recognized at 2280 Ma (SE Asia, Brazil, India), 2115 Ma (W Africa, Brazil), 1560-1550 Ma (Laurentia, Australia, Amazonia), 560 Ma (Arab/Nubian shield, SW Europe), 450 Ma (Avalonia, Cadomia, central Asia), and 290 Ma (central Asia, NW Laurentia). Peaks of more regional significance occur at 3785, 3308, 2740, 2730, 2710, 2695, 2690, 2555, 2500, 1800, 807, 172, and 119 Ma. Global peaks in juvenile crust preservation require that recycling rates of continental crust into the mantle are relatively small compared to crustal production rates. One way of accomplishing this for the peak at 2.7 Ga is by increasing the production rate of oceanic plateaus, which because of their buoyancy, resist recycling into the mantle, and become the nuclei for continental cratons. In support of this model is the widespread occurrence of 1) Late Archean greenstones with mantle plume geochemical affinities, and 2) Archean subcontinental lithosphere with 2.7-Ga Re-Os ages, which appears to represent plume restite material. In contrast, increased preservation of juvenile continental crust at 1885, 1705, 1655 and 1620 Ma may reflect enhanced preservation in back-arc basins associated with an extensive accretionary orogen (or orogens) that developed around the margin of the Paleoproterozoic supercontinent Columbia. A single mantle plume event, howver, cannot readily account for the four

peaks in crustal preservation spread over 265 My.