Crustal recycling vs. mantle input: The crustal evolution of South America from Hf isotopes of zircon

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We trace the crustal evolution of South America from Eoarchaean to Palaeozoic time with Hf-isotope data of > 1100 detrital zircon grains from the Ediacaran to Palaeozoic Gondwana margin in the south-central Andes. During that time, South American Gondwana was the predominant source as indicated by dominating zircon U-Pb ages of < 700 Ma and ca. 1 Ga for most investigated sedimentological units. The oldest analysed zircon grains have crustal residence ages of 3.8-4.0 Ga, which is in accordance with complete recycling of existing continental crust on Earth around 4 Ga. We confirm three major Archaean, Palaeoproterozoic (Transamazonian) and late Mesoproterozoic to early Neoproterozoic (Grenville-age) crust-addition phases, reflected by zircon with positive εHf(t) and zircon with similar crustal evolution trends, as well as several igneous phases during Proterozoic to Palaeozoic time involving mixing of juvenile and crustally reworked material, as indicated by a mixture of zircon with negative and positive εHf(t). Archaean crust was reworked during the Palaeoproterozoic Transamazonian igneous phase. This material in turn partly was reworked during the late Mesoproterozoic to early Neoproterozoic Grenville-age phase. An igneous belt of this age can be postulated along the palaeo-continental margin of South America. Grenville-age material was reworked during Palaeozoic arc activities. Hence, during the Palaeozoic era likely crustal reworking dominated over juvenile addition, despite the proto-Palaeozoic margin being active during long time intervals.