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Provenance constraints on the Cretaceous-Cenozoic drainage evolution of the Amazon basin

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The northern part of South America has undergone several major changes in its tectonic setting since the Triassic, evolving from oceanic rifting to the development of a retroarc-foreland basin on its Andean margin, leading to margin extension and continental uplift following the breakup between Africa and South America. So far, it is unclear when and how these geodynamic events affected the paleo Amazonian drainage. In this study, we investigate the provenance of Meso-Cenozoic sedimentary rocks deposited in the Huallaga and Madre de dios basins basins (Peru) and Acre basin (Brazil), based on their Sr-Nd isotopic compositions and U-Pb zircon dating. The Triassic–Jurassic samples from the Huallaga basin have ÎµNd (0) values ranging from -7.9 to -10.0 and main U- Pb zircon peaks at 0.9–1.3 Ga (31-33%) and 0.5-0.7 Ga (21-28%) that suggest a mixed clastic supply from the Western and Eastern Cordillera within a back-arc setting. Samples from the Albian–Maastrichtian interval yield much lower ÎµNd (0) values (-16.8 to -18.6) and a dominance of zircon grains derived from terranes in the easternmost Brazilian shield (Ventuari-Tapajos (2.0–1.82 Ga), Rio Negro-Jurena (1.82–1.54 Ga) and Rondonia San Ignacio (1.54–1.3 Ga), thus indicating a cratonic source for these sedimentary rocks. In the Madre de Dios basin, Early Maastrichtian sedimentary rocks have also low ÎµNd(0) values (-15 to -16) and they are characterized by Precambrian-inherited zircon grains. The late Cretaceous sedimentary rocks of the Acre basin (Serra do Divisor) yield low ÎµNd (0) values (between -19 and -21). At the time of the writing of this abstract, zircon U-Pb dating on these late Cretaceous samples is still under acquisition. Taking together, all these provenance data suggest the existence of a cratonic drainage system by Early Campanianâ€' Maastrichtian times probably sourced by the Central Brazilian shield. The Early Paleocene–Eocene sedimentary rocks record the first arrival of Andean detritus in the Amazonian retroarc foreland, with ÎµNd (0) values ranging between – 5.6 to -12.0 and up to 16% of the zircon grains yielding ages younger than 120 Ma. These provenance data document the existence of a long-lived Aptian–Maastrichtian continent-wide cratonic drainage in the northern part of South America. The formation of a Late Maastrichtian–Early Paleocene mountain chain in the Peruvian Andes associated with the onset of provenance from the Andean orogenic belt suggest that the earliest Andean-Amazonian rivers are no younger than Late Maastrichtian-Early Paleocene. Compared with Paleogene sedimentary rocks, the Neogene sedimentary rocks of the Acre basin (Brazil), have higher ÎµNd (0) values (between -4.3 and -7.5) and a greater proportion of zircon grains ages younger than 120 Ma which suggest that they are sourced from the Andes. In addition, one sample (AC 61) yield 7 zircons grain age between 5 +- 0.38 Ma and 7+- 0.08 Ma. These later data indicate a source located in the Peruvian Altiplano (Barroso group, Puno area) and give a minimum age for the uplift of the Fitzcarrald Arch at ca 5 Ma. Hence together with previously published studies, this indicate that the modern Amazon drainage system is no younger than the Pliocene.