Growth of the South American convergent margin (lat. 31°-36°S) during Late Paleozoic times: A U-Pb and Hf-isotope study of detrital zircons from a fossil accretionary system

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Laser ablation ICP-MS U-Pb and Lu-Hf isotope studies of detrital zircon from different levels of the Chilean coastal accretionary system and the collisional Guarguaráz Complex W of the exotic Argentine Precordillera terrane delineate the growth pattern of southern South America during Paleozoic times: Zircons in the latter area mainly display a broad U-Pb age cluster at 0.98-1.50 Ga similar to the variation in sediments of the Argentine Precordillera, which were subducted at its western suture. By contrast, the age pattern of detrital zircons from the Late Paleozoic Chilean accretionary prism shows a mixed provenance, i.e. from the Argentine Precordillera as well as from the NW-Argentine basement to the east of it. Here, an additional age cluster of 0.39-0.58 Ga is typical for the variation of zircons grown during the Pampean and Famatinian orogenies in NW-Argentina. Minor ages of 0.60-0.98 Ga may represent the youngest zircon ages from the Precordillera and/or from the Brasiliano orogen. A second major age cluster at 1.0-1.4 Ga is consistent with a mixed signature of recycled zircons from the Precordillera and from the NW-Argentine basement. Minor age clusters between 1.50 and 3.20 Ga suggest multiple recycling of material derived from cratons in the interior of Gondwana.

Whereas metagreywackes of the coastal accretionary system at 35°S were deposited at a stable margin prior to the onset of subduction, youngest euhedral zircons (295-360 Ma) in metagreywackes at 31°S derived from a concomitant magmatic arc and were incorporated into basally accreted as well as forearc basin sediments. Initial Hf-isotope composition of around 150 representative zircons from the different age groups reveal that the respective protoliths originated from recycled sources with variable crustal residence time as well as directly from juvenile, mantle-derived melts.

Tracing terrestrial and cosmic dust with helium isotopes

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Noble gases have made significant contributions in paleoclimate studies over the past decades. Recent studies indicate that helium analyzed in key climate archives, such as marine sediments and ice, is dominated by interplanetary dust particles rich in implanted solar wind and terrigenous dust rich in radiogenic helium.

Because the helium isotopic composition of these two endmembers differs by about 4 orders of magnitude, helium isotopes, particularly their combination, are powerful proxies to monitor the flux of cosmic and continental dust.

Here, I present case studies from different sampling archives with an enphasis on Helium-4 as a novel tool for the study of eolian dust transport, dust provenance, environmental conditions of the dust source region and resulting implications for the interpretation of the paleoclimatic record.