

Provenance of the middle Jurassic-Cretaceous sedimentary rocks of the Arequipas basin (South Peru) and implication for the geodynamic evolution of the Central Andes

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The southern Peruvian margin is considered a type locality for long-lived, active continental margin and has been the site of almost continuous subduction since at least the Cambrian. Following Triassic rifting, the southern Peruvian margin is supposed to have experimented extensional backarc setting but definitive evidences are scarce. Unlike other margin, the southern Peruvian margin has not been modified by terrane accretion since the onset of subduction and hence the sedimentary rocks of its adjacent basin may have the potential to record the geodynamic history of the margin between the Mitu Triassic rifting episode and the late Cretaceous onset of compression. In this study, we investigate the provenance of middle Jurassic–Santonian sedimentary rocks deposited in the Southern Peruvian Arequipa basin based on the measurement of 42 Sr-Nd isotopic composition, 993 U-Pb zircon ages and 232 Lu-Hf isotopes. The middle Jurassic formation (Puente and Cachios formations) have mean $\epsilon_{\text{Nd}}(0)$ values between from -8.5 (standard deviation (STD): 0.76) and -9.6 (STD:3.05) and are dominated by Brazilian/Pampean (0.5-0.7 Ga) Greenville/Sunsas (0.9–1.3 Ga) zircon U-Pb peak age which suggest an Eastern Cordillera provenance. An eastern provenance is also confirmed by the presence of juvenile to evolved nature of Hf isotopic Permian zircons that may be sourced by the the Eastern Cordillera. The Labra formation is marked by the first appearance of Triassic-Jurassic zircons from the Chocolate formation and by a strong increase in Famatinian zircon contribution but has similar other zircon age population contributions and $\epsilon_{\text{Nd}}(t=0)$ values to those of the middle Jurassic formations thus suggesting a mixed provenance between Eastern Cordillera and/or Altiplano and Coastal Cordillera sources. The Titiyan Gramadal Formation show similar $\epsilon_{\text{Nd}}(t=0)$ values but distinct U-Pb zircon age pattern with almost similar contribution from all Precambrian sources of the Amazon craton and Eastern Cordillera which suggest a main source located in the Eastern Cordillera or in the Amazon craton. The presence of Jurassic zircons and dominance of Greenville/Sunsas and Brazilian/Pampean zircons population suggest a mixed provenance with sources located both in Coastal and Eastern cordilleras for the Hualhuani formation (Berrasian). Finally, the Santonian Chilcane Formation has the highest $\epsilon_{\text{Nd}}(t=0)$ value (-5.5) and is characterized by strong contribution of Andean volcanic arc zircon, Jurassic, Permian, and Famatinian zircons which suggest a that these sedimentary rocks are mainly alimented by the Coastal Cordillera. Our multidisciplinary provenance dataset suggests that the middle Jurassic to early Cretaceous sedimentary rocks of the Arequipa basin are predominantly sourced by the Eastern Cordillera and to a lesser extent by the Coastal Cordillera. These associated with recent reevaluation of the depositional setting of the Jurassic to early cretaceous formation and the cumulative proportion curves of zircon age distribution suggest that the Arequipa basin tectonic setting is not that of backarc setting but rather reflect a rift like setting.