8th International Symposium
on Andean Geodynamics
(ISAG)

The Río Cañete Basin: Implications for the Mesozoic geoynamic evolution of the Peruvian margin

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The evolution of the Rio Cañete Basin provides a robust geodynamic model that can be extrapolated throughout the Peruvian margin. Transtensional crustal attenuation during the Jurassic early stages of Andean oblique subduction accounts for major crustal thinning and regional arc volcanism. Arrival of the lost “Chivaterous Plateau”, explains the termination of the Jurassic arc and development of a Neocomian shallow subduction and slab breakoff. Regional marine transgression was accompanied by patchy arc volcanism as well as localized subduction of an oceanic fracture. Protracted and persistent transtension supports the Albian/Cenomanian high rates of extension and upwelling of primitive mantle.
The Jurassic calc-alkaline intra-arc is unbroken and displays different degrees of crustal contamination as documented in the Puente Piedra Group. Subduction slab input is displayed by the negative Nb and Ti anomaly. However, the LREE enrichment and moderately slope similar to the OIB contrast with the MREE and HREE gentler slope. The overall flattening and discrete HREE spoon shape suggest pyroxene and subordinate amphibole fractioning. Still, the negative Eu anomaly, and more siliceous magmatism in the south supports the significant feldspar fractioning and higher crustal contamination.
Subduction Flattening during approach of an oceanic plateau triggered the abrupt collapsing and drowning of the Jurassic arc edifice and the sharp provenance change from a volcanic to a quartz rich basement source. Still, the timing and uplift of the Marañon Block and the Arequipa Massif, the synchronous subsidence between these basement uplifts, the Neocomian volcanic lull, and the restricted deposition of this Neocomian quartz rich clastic wedge west of the Marañon Block bolsters a Neocomian flat slab. The presence of 145-110 Ma alkaline to subalkaline basalts and andesites lavas along a linear belt west of the Marañon Block supports the slab breakoff. The chondrite normalized REE patterns amid OIB and EMORB, with almost flat HREE and almost absence of crustal contamination suggest amphibole and pyroxene fractioning. The continuous marine transgression is recorded by the shales and limestones of the Lima Group that terminated during Aptian times. The localized and anomalous subaqueous Pucusana Formation volcanism was associated with subduction of an oceanic fracture coeval with mantle upwelling. Indeed, the gently LREE and MREE slope and almost flat HREE chondrite normalized spider diagrams suggest pyroxene fractioning.
The almost continuous transtension set up since the early Mesozoic triggered the large pull-apart basin developed during the Albian/Cenomanian. The basins thus developed, were characterized by variable crustal attenuation and subsidence and thick volcaniclastic deposition. The strong Nb negative anomaly in the Casma Group implied subduction slab input. But, the gentle and higher enrichment in LREE similar to OIB, and the almost flat HREE akin to EMORB and NMORB with and overall subtle Eu anomaly showed a significant contribution from undepleted mantle and important pyroxene fractionation.