

ARCHEAN TERRAINS IN SOUTH AMERICA

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The Brazilian Shield comprises several cratonic areas of different size, surrounded by Neoproterozoic mobile belts. Archean rocks occur preferentially within the old stable domains, but also as reworked basement inliers within the younger belts. Terrains of unquestionable Archean age have not been identified within the Andean Chain.

The usual duality of Archean terrains encountered in all continents (granite-greenstone vs high-grade associations) is also valid for South America.

The largest region in which Archean supracrustals of metavolcanic and metasedimentary origin are found, in association with granitoid and gneissic rocks, occurs in the Carajás range within the Amazonian Craton, occupying an area of slightly less than 100,000 sq. km. Other smaller granite-greenstone terrains are found within the São Francisco Craton (Brumado, Rio das Velhas, Piumhi) and within the Central Goiás massif (Crixás), the latter being thermally reactivated in the Neoproterozoic. The available geochronological data for those terrains indicate the interval between 2.6 and 2.8 Ga as the most important in terms of crustal growth. Many older radiometric results up to 3.4 Ga were also found, and are related to different episodes of crustal accretion/differentiation, essentially from mantle-derived materials.

Two very large areas with continuous outcrop of Archean high-grade terrains occur in Venezuela (Imataca Province) and in the State of Bahia, eastern Brazil (Jequié Complex). They have similar general characters: in both units, basic to acid granulite is usually found combined with subordinate orthogneiss, migmatite and granitoid, indicating retrogression at medium grade, during superimposed orogenic events. The Imataca and Jequié terrains comprise areas in excess of 50,000 sq. km, and represent portions of the Archean lower crust, reworked and exhumed tectonically, as large cratonic fragments, within Early Proterozoic orogenic belts. Other Archean high-grade terrains occur in smaller areas within the Rio de La Plata Craton, the southwestern part of the Amazonian craton and as reworked tectonic slices in the interior domains of some of the late Proterozoic mobile belts, such as the Juiz de Fora, Itatins and Serra Negra basement inliers within the Ribeira belt in Southeast Brazil. The Brazilian Archean granulites, in general, do not exhibit depleted LILE concentrations. In addition, their Sr initial ratios vary roughly between 0.700 and 0.710, indicating that, at least partially, crustal reworking has been an important feature in the origin and evolution of the Archean lower crust.

The analysis of the Archean elements in South America indicates that the individual terrains are very heterogeneous. Different terrains exhibit contrasting nature, age and evolution, and there are also variations among different domains of a single terrain. This supports a general picture of great mobility, with numerous small microcontinents or microplates growing by mantle-derived magmatic processes, and colliding with each other, producing reworking and some recycling into the mantle. Eventually, by the end of the Archean (~2.6 Ga), some large continental masses with dimensions of the order of several hundred sq. km, came into existence by accretionary processes, allowing for the first time the accumulation of very extensive sedimentary basins, and the consequent development of large elongated folded belts.