

Detrital provenance of the Grenvillian Oaxacan Complex, southern Mexico: a U-Pb and Hf zircon perspective

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The Oaxacan Complex is the largest exposure of Grenvillian-age rocks in México, constituting the backbone of the Oaxaquia microcontinent. Whereas the main rock-forming events were previously established at 1.15-1.2 Ga (charnockite-syenite-gabbros), 1.02 Ga (AMCG suite), 990 Ma (granulite-facies metamorphism), and ca. 970 Ma post-tectonic pegmatites, no data are yet available to establish provenance links with other Grenville-age terranes. In this work we studied zircons belonging to 12 granulite samples, variably affected by retrogression. LA-ICPMS U-Pb geochronology was employed on selected zircons to determine their crystallization age and geochemistry. The results of the analysis of about 100 crystals per sample show that the studied zircons range between ca. 940 to 1400 Ma, with only three samples having zircons between 1400 and 1600 Ma, and only one showing older zircons up to ca. 1775 Ma. Whereas some of the slightly discordant (1- 5%) zircons in several samples show ages younger than the granulite metamorphism (probably as a result of Pb loss), and thus a disturbed geochemical pattern (abnormal enrichment in LREE, decreasing HREE), a few metamorphic zircons show flat and depleted HREE patterns, contrasting with the igneous pattern of older zircons (positive Ce anomaly, negative Eu anomaly, enriched HREE pattern). LA-MC-ICPMS Hf isotopy of dated zircons indicate that some of the detrital zircons have an influence from an older crust (negative ϵ_{Hf} values between -2 to -14), whereas the metaigneous samples falling in age between 1.1 and 1.2 Ga are more primitive, having positive ϵ_{Hf} values of +2 to +10, and T_{DM} model age of up to ca. 1.6 Ga.

The main distributions observed using the kernel density estimator diagrams fall in the range 975-995 Ma (six samples), 1100 Ma (four samples), and 1120- 1170 Ma (six samples). Only the southernmost sample shows a marked peak at ca. 1400 Ma. The application of the Kolmogorov-Smirnov (K-S) statistical test to the studied samples, and particularly the comparison of obtained P-values yield interesting similarities. Overall, two sample groups show internal similarities, i.e. they may belong to the same source area, whereas only one sample is dissimilar, failing to pass the K-S test. Comparison of these data with the timing of comparable events in the Sveconorwegian orogens, the Sunsas and Rondonia-San Ignacio belts of Amazonia, and some of the Precambrian massifs cropping out in the Andes help to constrain possible Mesoproterozoic conjugate margins of Oaxaquia.