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New geochronological ages (U-Pb/Lu-Hf) from high-pressure rocks of the Escambray terrane and Santa Clara serpentinite mélange, central Cuba. Regional correlations and geodynamic implications

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Petrological and geochronological data of high pressure (HP) rocks from Cuba and Dominican Republic indicate continuous subduction in the northern edge of the Caribbean since ca. 120 Ma. However, expected correlation of the associated subduction zone towards the west in Guatemala is uncertain, for similar HP rocks in this region have metamorphic ages as old as 150 Ma. In this contribution we present new geochemical and U-Pb/Lu-Hf ages of HP rocks from the Escambray terrane and the central Cuba serpentinite mélange that allow geodynamic correlations between the Greater Antilles and Guatemala during the early and late Cretaceous.

The Escambray composite terrane constitutes a metamorphic accretionary complex containing oceanic and platform-derived metasedimentary and metaigneous rocks that were tectonically assembled in the Caribbean subduction environment during the latest Cretaceous. The complex crops out as two domes, named Trinidad to the west and Sancti Spiritus to the east, forming a tectonic window below the arc-related Mabujina amphibolite complex and the allochthonous Cretaceous volcanic arc terrane. The latter overrides the central Cuba mélange, which contains low-pressure ophiolitic blocks and HP blocks of eclogite, garnet amphibolite and blueschist facies rocks within a serpentinitic matrix. This serpentinite mélange and similar melange bodies within the Escambray complex have been interpreted as fragments of the Caribbean subduction channel.

The studied HP samples are of basaltic composition, poor in K2O (<0.34 wt %) and Rb (< 3.05 ppm), relatively rich in Ta (0.07-0.77 ppm) and Hf (0.74-4.17 ppm), and rich in Nb (0.68- 13.53 ppm). Most samples show a REE chondrite-normalised patterns characterized by a subtle LREE depletion, except a few samples which are characterized by slight enrichment in LREE. Based on their distinctive trace-element contents, most of the basaltic protholiths of the samples are identified as E- to N-MORB signature. Some samples of the Escambray complex show, however, enrichment in alkali and LIL elements, suggesting a) a passive continental margin origin of the protoliths or b) contamination of (altered) MOR-derived rocks by fluids in the subduction environment.

A single zircon U-Pb age of 131.1±1.3 Ma for a block of garnet amphibolite from a sliver of oceanic serpentinite mélange from the Gavilanes unit (Trinidad Dome, Escambray terrane) is interpreted as reflecting the time of basaltic protolith crystallization or the time of HP metamorphism. The last interpretation, though still uncertain, is supported by a new garnet Lu-Hf age of 126,04 ± 0.54 Ma for a block of eclogite from the central Cuba serpentinite mélange. SHRIMP analyses of single-grain zircons from two eclogite samples from the Gavilanes unit on the Cipiabo River (Sancti Spiritus dome, Escambray terrane) show a broad spectrum of ages between 172 Ma and 2.4 Ga. We interpret the occurrence of Middle Jurassic to Paleoproterozoic zircons in these eclogites as inherited, suggesting crustal contamination of the basaltic protoliths. A new garnet Lu-Hf age of 70,3 ± 1.1 Ma for an eclogite on the Higuanojo River (Sancti Spiritus dome) agrees with most geochronological data from the Escambray terrane obtained so far.

These data, combined with previously published age data of HP and low pressure (MOR- and arc-related) rocks, indicate continuous subduction in the Cuban branch of the northern leading edge of the Caribbean plate since ca. 130 Ma until, at least, 70 Ma and corroborate the interpretation that the onset of terrane(Caribeana)-trench collision took place during the latest Cretaceous, in agreement with geodynamic models for the region. The data also allow correlating paleosubduction zones of the Antilles and Guatemala in the same period, for ages of high pressure rocks from the Motagua valley serpentinite mélanges, the Chuacús complex, and the basement of the Maya block range 150-70 Ma.