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Spring, 2023

Insights into Caribbean Tectonics from a Detrital Zircon U-Pb Provenance Study of Siliciclastic Strata in Western and Central Cuba

Cuba is the largest island in the Caribbean region yet its role and origin in Caribbean plate tectonics remain elusive due to a general lack of modern geochronologic, stratigraphic, and provenance constraints. However, the geologic and tectonic evolution of Cuba is key for understanding and testing Caribbean plate tectonic models. In specific, Early Mesozoic siliciclastic strata in western and central Cuba, recording the break-up of Pangea, hold critical insights into the tectonic configuration of the proto-Caribbean region during the break-up of Pangea and before formation of the modern Caribbean plate. These siliciclastic strata include the Jurassic aged San Cayetano Formation located in the Guaniguanico terrane of western Cuba and the Constancia Formation found in the Placetas belt of the Central Cuban fold belt. Limited geochronologic data has failed to identify depositional ages and sedimentary provenance of these units, hampering the tectonic and palinspastic reconstructions of western and central Cuba. We carried out an extensive LA-ICP-MS detrital zircon (DZ) U-Pb study of these early Mesozoic siliciclastic strata where new data from the western Cuba San Cayetano Formation (n=19) show a strong Permo-Triassic Chiapas batholith and Meso-Proterozoic Grenvillian/Oaxaquian provenance signature, while the central Cuba Constancia Formation (n=6) displays a similar, but more variable Permo-Triassic and Meso-Proterozoic DZ signature. By comparing with DZ signatures from regional early Mesozoic strata, the Cuban San Cayetano and Constancia Formations appear to be correlative with the syn-rift Todos Santos basin in the SE Yucatan region. This Mexican unit was predominantly sourced from the Chiapas batholith and Oaxaquian basement during early Mesozoic rifting. The similarity in signatures between the Cuban and Mexican stratum restores the palinspastic position of western and central Cuba to SW Yucatan where subsequent detachment and shearing off the Yucatan margin during the Late Cretaceous translated the Jurassic units NE with the Caribbean plate, eventually colliding with the Florida-Bahamas margin in the Paleogene. Consequently, this framework strongly supports an allochthonous model for the Caribbean plate.

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