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Testing Models for the Origin and Metamorphic History of Metasedimentary Complexes in the Caribbean Using Zircon U-Pb Geochronology and Trace Element Data

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Metasedimentary rocks are a common lithology within paleo-subduction complexes exposed throughout the Caribbean, including the Samana terrane, located in the Samana Peninsula, Dominican Republic. The origin, metamorphic evolution, and collisional histories of these metasedimentary complexes remain debated, with contrasting proposals of sedimentary provenances and estimated timing of collision. To address these uncertainties, it is crucial to place constraints on the sediment provenances comprising these complexes as well as the timing of metamorphism, which can be done through zircon analysis. Zircon analyses were conducted using single-shot laser-ablation split stream-inductively coupled plasma mass spectrometry (SS-LASS-ICPMS) to present new U-Pb age and trace element data from the El Rincon Marble unit in the Samana terrane.

Depth profiles through zircons from the El Rincon Marble show that most zircons record evidence for core-to-rim age zoning. Preliminary U-Pb age data show that the zircons record ages range from the Miocene (~22 Ma) to the Mesoproterozoic (~1501 Ma). The total age distribution of zircon places the dominant age populations in the Paleocene (~27% of all ages) and the Late Cretaceous (~19% of all ages). Regardless of the age of the analyzed zircon domain, most zircons have Th/U ratios >0.1. Within this data set, Th/U ratios alone cannot definitively be used to determine magmatic or metamorphic rims. Therefore, Ti-in-zircon thermometry and zircon trace and rare earth element (TREE) signatures for the identified age populations will be used to determine the origin of the zircon (metamorphic vs. igneous). Correlation of zoned zircon U-Pb ages that record metamorphism will be used to constrain the timing of collision whereas igneous zircon domains will be used to determine the provenance of sediment. To understand if metasedimentary units in different Caribbean paleo-subduction zones record different origins and metamorphic histories, zircon results in the El Rincon Marble unit in the Samana terrane will be compared to results from the Escambray terrane in Cuba.