NEW HIGH-PRECISION U-PB ZIRCON DATING OF CENTRAL ATLANTIC MAGMATIC PROVINCE: IMPLICATIONS FOR THE TRIASSIC-JURASSIC EXTINCTION AND THE ASTROCHRONOLOGICAL TIMESCALE

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The approximate coincidence of the extinction event at the Triassic-Jurassic boundary (TJB) and magmatism within the Central Atlantic Magmatic Province (CAMP) is supported by stratigraphic, paleomagnetic, and astrochronological studies and suggest a causal relationship between CAMP magmatism and the extinction event. These approaches have been used to estimate the duration of CAMP volcanism to no longer than 0.6 Ma. This estimate, however, has never been tested using high-precision geochronology. The purpose of this study is two fold; first to test astronomical timing models within the Triassic-Jurassic (T-J) sedimentary rift basins located along the Eastern U.S. using U-Pb geochronology. Second, use these geochronologic and astronomical datum to constrain the onset and duration of the CAMP and clarify the relationship in time between the magmatic province and the T-J boundary extinction event. We have sampled five CAMP flows and sills from the Culpeper, Newark and Fundy Basins. Though there are several accessory phases found in mafic rocks amenable to U-Pb dating, zircon is the only phase capable of yielding weighted mean dates with <0.1% uncertainties. Previous geochronologic studies have dated flows from CAMP with analytical errors on the order of ± 1-3 Ma. In contrast, all samples dated in this study using zircon U-Pb ID-TIMS yield dates with total errors including decay constants of ± 0.2-0.25 Ma. This level of precision allows construction of an enhanced time-line for CAMP magmatism and its possible synchroneity with the TJB. Dates from 5 flows and sills confirm that the duration of CAMP magmatism is no longer than ~0.5 Ma. Error-weighted mean dates reveal statistically valid differences between the different CAMP magmatic bodies. Basalt flows, such as the North Mountain and Preakness provide the best stratigraphic constraints with which to test astronomical calibrations. The difference in mean dates between these flows is in excellent agreement with the lapse of time predicted by astronomical tuning models, confirming the reliability of the astrochronological model for these basins.