PROBING THE SECRETS OF RODINIA: PIECES OF THE SUPERCONTINENT PUZZLE EXTRACTED FROM $^{40}$Ar/$^{39}$Ar GEOCHRONOLOGY OF DETRITAL MUSCOVITES

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Despite study by several investigators many features of the Precambrian supercontinent Rodinia remain enigmatic. $^{40}$Ar/$^{39}$Ar geochronology of detrital muscovites from Mesoproterozoic sedimentary rocks across the southwest United States is employed in an attempt to refine models for continental alignment within Rodina, determine stratigraphic age and provenance. Specifically, detrital muscovite age data are reported from the Apache group in southeast Arizona, the De Baca group in New Mexico and the Unkar group in the Grand Canyon. Significant provenance variations are observed and new constraints on the age and correlations can be deduced. Approximately 310 single muscovite ages from the Pioneer shale unit of the Apache group yield a strongly bimodal age population with peaks at about 1.4 Ga and 1.65 Ga. This result is consistent with a U/Pb zircon age of 1.33 Ga from a volcanic unit within the Pioneer and the age populations support a southwestern Laurentia source. Stratigraphically higher in the Apache group, the Dripping Springs formation has a more diverse age population that ranges between 1.20 to 1.60 Ga. The youngest apparent ages indicate that the Dripping Springs formation is no older than 1.2 Ga and challenges correlations of the overlying Mescal limestone with the well dated 1254 Ma (U/Pb zircon) Bass formation in Grand Canyon. The De Baca Group is constraint to be older than about 1.1 Ga based on an inferred 1.1 Ga age for crosscutting diabase. The detrital muscovites from a shale horizon have a dominant age population at about 1.4 Ga with smaller peaks 1.6 Ga and 1.2 Ga. The 1.4 Ga and 1.7 Ga ages are likely locally derived from Meso and Paleoproterozoic crust to the north. The younger 1.2 Ga dates may suggest a depositional age that is less then 1.2 Ga. Muscovite from a quartzite unit in close proximity to the diabase has ages between about 0.5 to 1.6 Ga. The youngest crystals have presumably under gone postdeposition argon loss and/or represent growth of new fine-grained mica at this time. Ages between 1.1 and 1.2 Ga may be provenance ages, but factors such as reheating associated with sill emplacement and post-deposition alteration may have caused argon loss. We cannot be specific about the depositional age of this unit. Two formations from the Unkar group from the Grand Canyon were investigated. A sandstone layer within the Hotauta conglomerate below a 1.254 Ga ash horizon yields dominantly 1.65 Ga muscovite with a single grain yielding a 1.4 Ga apparent age. These ages are common for the underlying basement, presumably locally derived and consistent with the Hotauta being older than 1.25 Ga. Higher in the Unkar section, several samples of the Dox Formation were sampled. Over 500 crystals display an age range from about 1.14 to 1.25 Ga with no 1.4 Ga or 1.65 Ga detritus. 1.11 Ga dikes and sills cut the Dox and therefore the depositional age of the Dox is constrained to be 1.11 to 1.14 Ga. This result indicates a Grenville source area for the Dox that presently crops out in SW Texas. Evidently large river systems carried detritus from an eroding Grenville highland several hundred kilometers to the Grand Canyon area.