AGE AND THERMOCHRONOLOGY OF K-FELDSPARS FROM THE MANSON IMPACT STRUCTURE; P. K. Zeitler, Dept. of Earth and Environmental Sciences, 31 Williams Drive, Lehigh University, Bethlehem, PA 18015-3188; M. J. Kunk, U.S. Geological Survey, Reston, VA 22092.

As a contribution to the effort to obtain a precise age for the Manson Impact Structure, we are approaching the problem from a thermochronological perspective, with the goal of extracting an age from $^{40}Ar/^{39}Ar$ age-spectrum analysis of partially overprinted K-feldspars taken from granitoid clasts. We find that shocked feldspars from Manson generally show a strong overprint in their age spectra, with more than 50% of each spectrum being reset. The reset portions of the age spectra correspond to gas lost from very small diffusion domains, and a characteristic of the Manson samples is the very large range in apparent diffusion dimensions that they display, with the smallest domains being some 400 times smaller than the largest domains. It is also noteworthy that the small domains comprise a substantial portion of the volume of the feldspars (50% or more). These observations are consistent with the extreme shock experienced by these samples. In detail, the spectra we have measured to date are saddle-shaped and show minimum ages of between 67 and 72 Ma, which we interpret to be maximum estimates for the age of the impact. In the case of one sample (M1-678.3; K-feldspar from a large syenite block located well below the apparent melt-matrix breccia in the M1 borehole), isotope-correlation analysis suggests the presence of a non-atmospheric trapped Ar component ($^{40}Ar/^{36}Ar$ of 660 ± 40), and an age of about 65.3 ± 0.5 Ma (2σ). Our interpretation of our results is that the shock of impact greatly reduced the diffusion-domain sizes of our samples, making them susceptible to significant Ar loss during heating associated with impact. It appears that while our feldspars were partially open to Ar loss, they equilibrated with a non-atmospheric Ar component, probably related to impact-related degassing of old basement around the impact site.

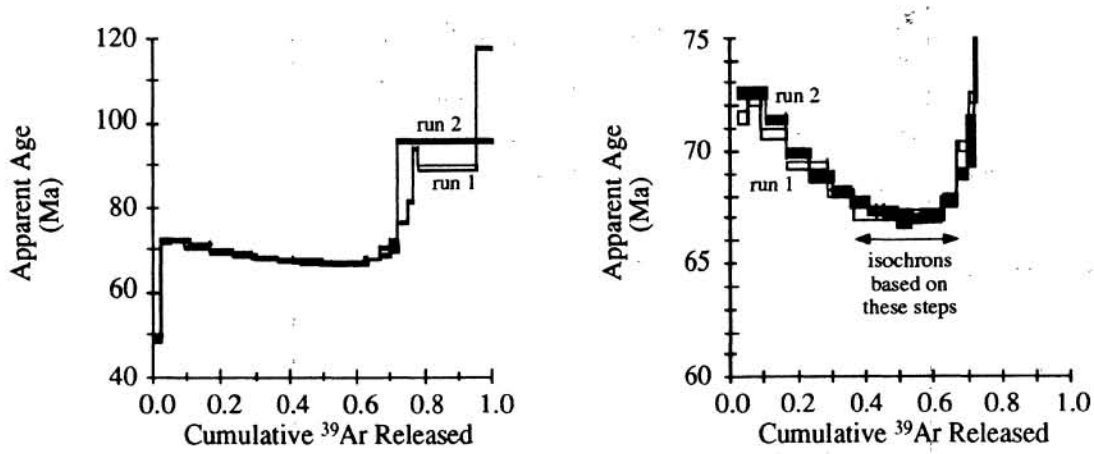
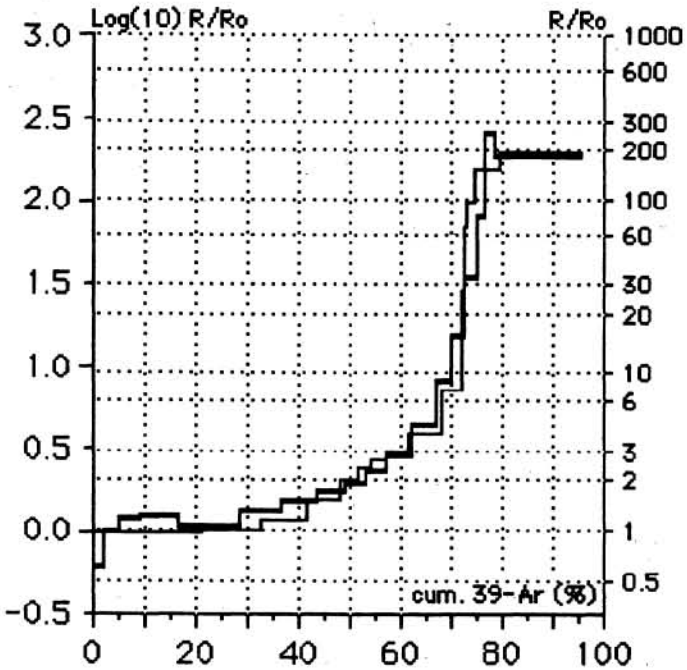


Figure 1. Age spectra from two preliminary analyses of sample M1-678.3 K-feldspar. The minimum age reached in the saddle is about 67 ± 0.7 Ma (2σ). Fish Canyon sanidine (27.79 Ma) and MMhb-1 hornblende (520.4 Ma) were used as irradiation monitors; Haitian tektites included in the irradiation package gave an age of 65.0 ± 0.2 Ma.

MANSON STRUCTURE THERMOCHRONOLOGY: Zeitler P.K. and Kunk M.J.



GRAIN-SIZE DISTRIBUTION:

	size*	volume (%)	Tc bulk (10°C/m.y.)
1	0.45	38.00	122.7
2	1.70	34.00	142.8
3	200.00	28.00	234.9

*Sizes relative to the smallest APPARENT size= 1.0

Figure 2. R/Ro plot for M1-678.3 K-feldspar. Thin line is model calculated from parameters given above. Note range in domain sizes of over 400, and large volume of small domains. Note also the low closure temperature of the smaller domains.

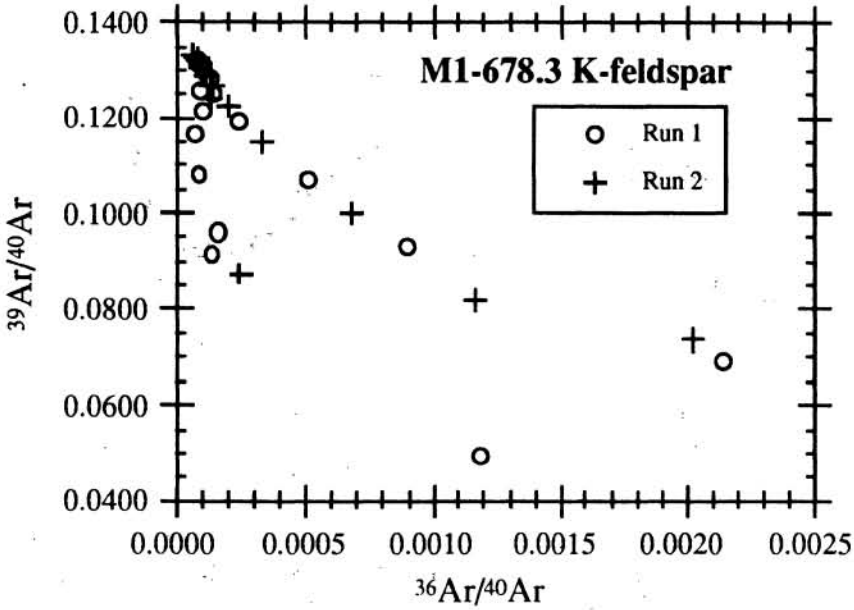


Figure 3. Isotope correlation plot for two analyses of sample M1-678.3 K-feldspar. The most radiogenic analyses define reasonable mixing lines between a trapped component (40/36 of about 660) and a radiogenic component corresponding to an age of about 65.3 ± 0.5 Ma (2σ).