1. Why in situ geochronology?

- When were they formed?
  - Beautiful stratigraphy observed by Curiosity on Mars. Nobody knows exactly when these layers were formed. Knowing these absolute ages is important to understand the processes that emplaced these deposits.

2. K–Ar Laser Experiment (KArLE) Concept

- An important goal of the community is to measure the age of various key geologic units to reconstruct Martian history and correlate it with other Solar System events (e.g., Earth history).

3. Experimental

- KArLE breadboard
  - 1-He:2Ar:2O laser:Optic Spectrometer
  - 2-Optical setup
  - 3-Colour for a camera recording the sidewall of the plasma
  - 4-Mirror
  - 5-Abatement cell
  - 6-Vacuum line including getter, pneumatic valves, torr/barn nosevalves
  - 7-Mass Spectrometer (Vapour Analyser CAMECA)
  - 8-2054 iQ laser:1064 nm, 30 mJ, 3 Hz

4. Summary

- We report new K–Ar isochron data for two ~380 Ma basaltic rocks, using an updated version of the Potassium–Argon Laser Experiment (KArLE).

5. KArLE results & isochrons

- Obtained isochron ages consistent with published K–Ar ages

6. Spot-by-Spot K–Ar ages

- Weighted average age: TL-18: 380 ± 22 Ma

7. To achieve ± 100 Myr error with a 4000 Ma rock

8. Performance of K–Ar dating with LIBS–MS

- Compiled K–Ar dating results published from multiple labs. Results from multiple laboratories yield whole-rock ages within error of accepted ages and precision close to theoretical.

9. Work in progress

- Using the laboratory breadboard to measure Mars and Moon analog materials
- Implementing PL5 to improve K measurement capability
- Pursuing funding for construction and test of the flight concepts

References: