EXPERIMENTAL SIMULATIONS OF RECURRING SLOPE LINEAE FORMATIONS. J. A. Heydenreich[1], J. C. Dixon[1, 2] and V. F. Chevrier[1]. [1]Arkansas Center for Space and Planetary Sciences, 332 N. Arkansas Ave, University of Arkansas, Fayetteville, Arkansas 72701, [jaheyden@uark.edu], [2]Dept. of Geological Sciences, 113 Ozark Hall, University of Arkansas, Fayetteville, Arkansas, 72701.

Introduction: Recurring slope lineae (RSLs) are dark streaks that appear annually on the martian surface [1]. They are hypothesized to be formed from liquid brine flowing downslope in the subsurface. Emerging from bedrock, RSLs occur on steep slopes during the warm spring-summer months and fade when the temperatures decrease in the winter. These features have been identified most commonly in the southern mid-latitudes facing the equator [1]. A distinguishable alcove is formed at the head of the RSL, continuing into a narrow channel and a depositional fan at the bottom of the feature [3].

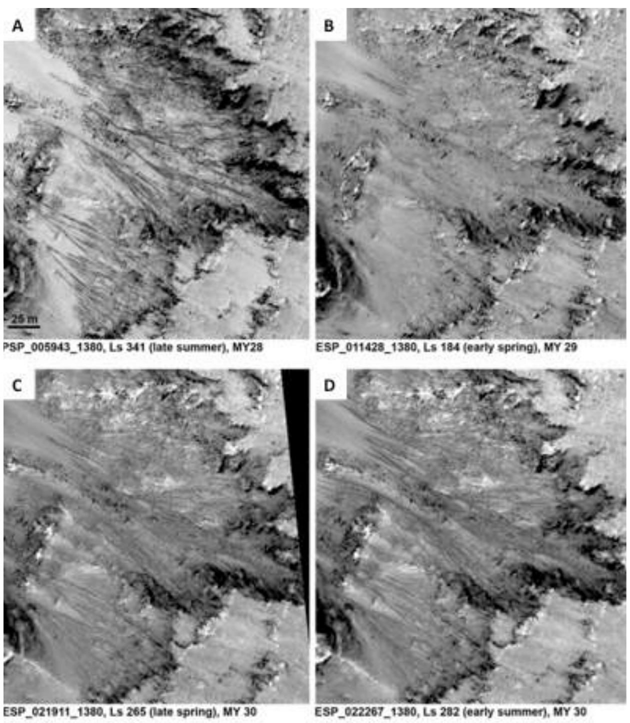

Figure 1: Represents the recurring properties of slope lineae. **A** shows the dark streaks appearing in Late Summer, fading in **B** and **C** in Early Spring of the following year and then reappearing that Early Summer in **D.** Figure produced from [1].

The recurring characteristics of RSLs imply that not only are RSLs dependent on seasonality, but they could also indicate a possible persistent subsurface water source. The presence of recurring water could form suitable, near-surface environments for life [2]. Although RSLs are generally found on steeper slopes, lower slopes are better candidates to find extant life. Lower slopes provide a better habitat for organisms or detritus because they are less likely to be flushed out from erosion [2].

Methods: In order to replicate RSLs on the martian surface, experiments were performed in a 0.67 m x 0.51 m wooden flume. Each experimental run used 8.0 kg of martian regolith simulant, JSC Mars-1. The bulk density of the regolith inside the flume was approximately 1.02±0.02 g/cm^3.

For each run, 8.0 kg of Mars JSC-1 was weighed and added to the wooden flume. The flume was set to the desired height in order to achieve a slope of 10, 20 or 30 degrees. The water source was introduced by funneling 100 mL of water through tubing to the flume. The entrance of the flume consists of a copper pipe centered at the top of the flume, just underneath the surface of the regolith. These experiments were conducted at room temperature.

The experiments were also replicated in a freezer maintained at -20 °C. This temperature is comparable to those on Mars during the summer months in which RSLs appear.

Figure 2: The experimental apparatus in room temperature at a slope of 30° showing the flume, copper pipe entrance and measured water in the lower right.

Results and Discussion: The results from each experiment show channels of varying lengths, along with aprons and alcoves (Fig. 3). The channel length for the -20 °C cold room experiments was 34.6±5.7 cm at 10 degrees, 44.5±10.4 cm at 20 degrees and 46.2±6.2 cm at 30 degrees. The channel length for the room temperature experiments was 24.6±5.5 cm at 10 degrees, 33.3±3.9 cm at 20 degrees and 34.6±6.7 cm at 30 degrees (Fig. 4).

The alcove is designated as the location where the water exits the copper pipe and creates a depression in the regolith. Alcove lengths averaged 3-5 cm for the cold room experiments and 3-4 cm for the room temperature experiments at all slopes. The depositional fan creates an apron at the bottom of the RSL at an average length of 16-27 cm for the cold room experiments and 4-16 cm for the room temperature experiments on all slopes. Although the lengths of the channels did not change drastically, the width of the stream channel decreased with increasing slope. It has been observed that channel widths decrease as slope increases [1]. Thinner channels were noticeable with the highest slope at 30 degrees.

The maximum height of the sediment deposition at the base of the channel was also observed. The terminal maximum height increased as the slope increased. The maximum height averaged between 0.5-1.2 cm in the cold room and 0.9-1.6 cm at room temperature.

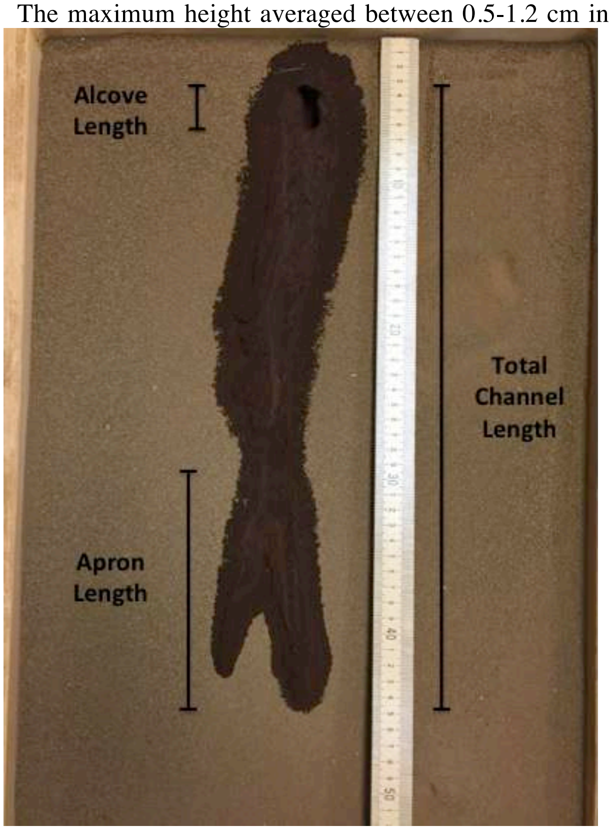

Figure 3: Gully formation following RSL simulation conducted with water at a slope of 10 degrees. The alcove, total channel length and apron are labeled.

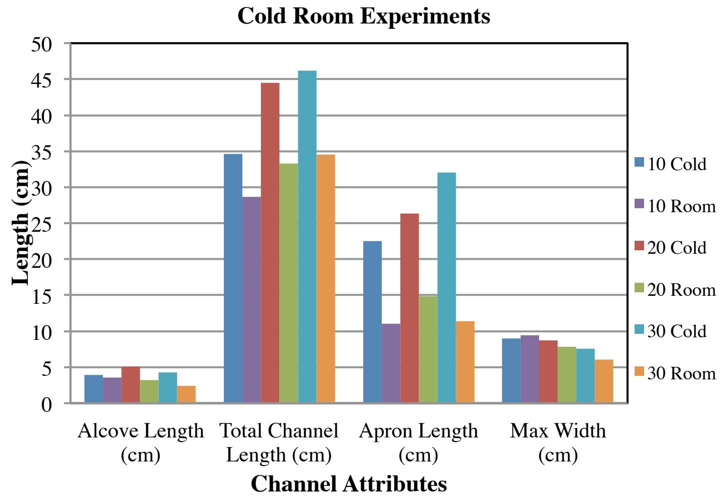

Figure 4: Average lengths (in cm) for each of four channel attributes (alcove, total length, apron and max width). Channel attributes correlate with lengths in Fig. 3. Measurements are averaged over five runs for each slope at 10, 20 and 30 degrees for the cold room and room temperature experiments.

There appears to be a distinction in RSL characteristics between the cold room and room temperature experiments. In the cold room experiments, channel, alcove and apron lengths all tend to be longer than those associated with the room temperature experiments. The channels of the cold room RSLs are also generally wider than those of the room temperature experiments (Fig. 4). However, the heights of the terminal lobes are higher in the room temperature environment than the cold room environment.

Future work will test additional slopes in order to better mimic the slopes associated with RSL formation. Additionally, future experiments will utilize water with viscosities that are more similar to possible brines found on Mars.

Conclusion: There was no significant difference in the total channel, apron and alcove lengths at the varying slopes (10, 20, and 30 degrees). There was a significant difference of the channel attributes between the cold room and room temperature environments. The width of the channels did appear to decrease with increasing slope. The maximum height of the terminal lobes of the channel increased in elevation as the slope increased in both environments. Further experiments will include additional slopes and different types of martian analog regolith.

References: [1] McEwen, A. S. et al. (2001) *Science* 333, 740. [2] Stillman, D. E. et al. (2014) *Icarus*, 233, 328-341. [3] Dickson, J. L. et al. (2007) *Icarus*, 188, 315-323.