INVESTIGATING THE PROCESSES CREATING GULLIES ON MARS. K.A. Coleman[1], J. Dixon[1,2], K. L. Howe[3], V. F. Chevrier[1] 1 W.M. Keck Laboratory for Space Simulations, Arkansas Center for Space and Planetary Science, MUSE 202, Fayetteville, Arkansas, USA < ksacolem@uark.edu>, 2 Dept. of Geological Sciences, 113 Ozark Hall, University of Arkansas, Fayetteville, Arkansas, USA.

Introduction: Since gullies were first identified on Mars by Malin and Edgett [1] the processes operating on the surface to create the gullies have been studied. [2-9]. We developed simulations to explore the parameters controlling gully formation on Mars. The simulations have included pure water and various water/ice slush concentrations in an attempt to constrain the processes creating gullies on Mars.

Methods: In attempt to address the enigmatic processes on Mars, we created a 1 m x 1 m flume filled with medium grain size sand and ran water down the slopes creating gullies with the same alcove, channel, apron form as gullies observed in satellite imagery from Mars [10-11]. Based on these simulations and suggestions that surface and subsurface ice could be partially melted by summer insolation [6] we developed a 3 m x 0.5 m hinged flume and began using water/ice slush [12] to better simulate the gradient of the slope observed on Mars.

Discussion: Our initial results showed that gullies could be created with morphometric forms similar to gullies observed on Mars using water. Statistically significant relationships were found between flow rates and several morphometric parameters. Evaporation rates have recently been shown to be lower on Mars than originally suggested [13, 14] which supports the presence of liquid water on the surface for periods of time sufficient to create gullies. As we adjusted the simulations by adding ice crystals to the slush and more closely emulate martian conditions, the forms created became more like those of traditional martian gullies. Length/width ratios have been calculated for traditional gullies on Mars and for the simulations. The pure water simulations have average gully length width ratios of 2.18 while the water ice simulation have an average length/width ratio of 2.10. Length/width ratios for traditional gullies calculated from HiRISE imagery of give values of 2.05 suggesting that the water/ice slush simulations are a better match for the processes overating on Mars than the pure water simulations.

References: [1] Malin, M.C. and Edgett, K.S. (2000) *Science, 288,* 2330-2336. [2] Heldmann, J. L.and Mellon, M.T. (2004) *Icarus, 168,* 285-304. [3] Balme M. et al. (2006) *JGR, 111,* E05001. [4] Dickson, J. L. et al (2007) *Icarus, 188,* 315-323. [5] Musselwhite, D. S. et al. (2001) *GRL, 28* 1283–1285. [6] Costard F. et al. (2002) *Science, 295,* 110-113. [7] Christensen, P.R. (2003) *Nature, 422,* 45-48. [8] Heldmann, J.L. (2005) *JGR,110,* EO5004. [9] Bart, G. D. (2007) *Icarus,187,* 417-421. [10] Coleman et al. (2007) *2nd International Workshop Exploring Mars and its Earth Analogues*. [11] Coleman et al. (2009) *Planetary and Space Sciences, 57,* 711-716. [12] Coleman et al., *GSA*, *submitted.* [13] Sears, D. W. G. and Moore S. R. (2005) *GRL, 32*, L16202. [14] Ingersol, A. P. (1970) *Science, 168*, 972.