PAIRED ANALYSIS OF DRY LAKES ON EARTH AND MARS. J. Buz[1] and K. M. Wood[1], [1]Department of Physics and Astronomy, Northern Arizona University, Flagstaff, AZ 86001. (jennifer.buz@nau.edu)

Introduction: Closed lake basins on Mars are potential future mission sites based on their nature as catchments for fluids and sediments over areas much larger than the basins themselves. These areas often show remarkable mineralogical and sedimentological diversity. However, the natural ability of these basins to collect a useful record of material deposition also leads to the accumulation of obscuring veneers subsequent to lacustrine activity, which can hinder remote sensing (RS) investigations of the original lake deposits [e.g., 1]. Dry lake environments on Earth have been proposed as Martian analog sites. Given the abundance of closed lake basins on Earth and Mars ([2,3]; Figure 1) we conducted a survey of published analyses on dry lakes, primarily in closed basins on Earth and Mars to compare minerals found. Our goal is to observe changes in minerals and grain size across closed lake basins and to observe the effects of obscuring materials.

Datasets: RS data is critical for identification of minerals on Mars where a rover or lander has not been sent. Because of the nature of RS data some groundtruthing studies must be conducted. We focused on studies where terrestrial remote sensing instruments were used and where groundtruthing was possible. A comparison of instruments is found in Table 1.

	Spectral Range, Sampling	Spatial Scale
AVIRIS-NG [4]	380-2510, 5 nm	.3 – 4 m
CRISM [5]	362-3920 nm, 6.5 nm	18 m
MASTER [6]	0.4-13 µm, 50 channels	5-50 m
THEMIS [7]	6-15 µm, 9 channels	100 m

Table 1: Comparison of RS instruments

Preliminary Results: We find many mineral similarities between dry lakes on Earth and Mars despite differences in scale and age (Table 2). Mineral specificity in terrestrial data is easier due to additional instruments and access.

Future Work: We will conduct mineralogical analyses on larger endorheic basins on Earth to better match the size of studied Martian paleolakes and will scale terrestrial datasets to Martian resolutions. We will conduct analyses on grain size changes across a lake basin using infrared data, similar to what has been done on Mars. We will use groundtruthing where available to assess the effect of post-lacustrine veneers.

Lake/ Playa	Planet	Minerals detected	Size (km)	Refs.
Badwater Basin	Earth	Halite Borates Gypsum Bloedite Rivadavite Carbonate Silicate Thenardite	12	[8,9]
Gusev	Mars	Saponite/Vermiculite Kaolinite Sulfates Halides Chlorides Carbonates Borates	160	[10,11]
Great Basin Playas	Earth	Vermiculite Montmor. Illite	3-19	[12]
Gale	Mars	Mg-Phyllosilicate Ca-Sulfate Olivine Pyroxene	154	[13–16]
Searles Lake	Earth	K-Feldspar Analcime Searlesite Phillipsite Illite Montmor. Chlorite Kaolinite	19	[17]
Jezero	Mars	Fe/Mg-Smectite Olivine Mg-Carbonate	45	[18]
Stonewall	Earth	Montmor.	3	[19]
Lake Hoare* *not always dry	Earth	Quartz Felspar Pyroxene Calcite Fe Oxide	4.2	[20]

Table 2: Survey of minerals identified in dry lakes on Earth and Mars

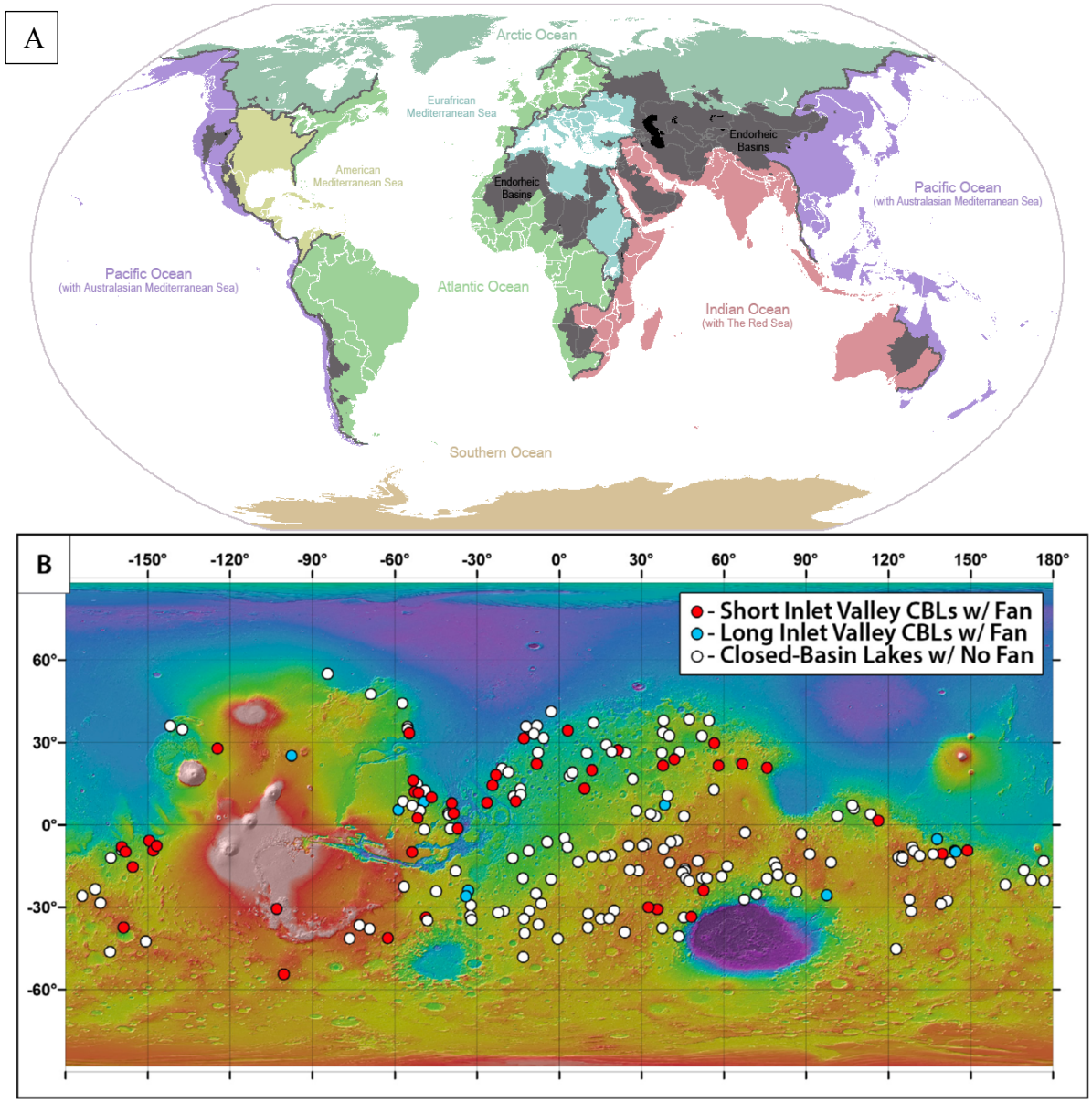

Figure 1. Distribution of closed basin lakes on Earth and Mars. A) The large endorheic basin in the Western US has been targeted by AVIRIS repeatedly, image from Rankin [3]. B) Figure from Goudge et al [4].

References: [1] Christensen P. R. (1982) *J. Geophys. Res. Solid Earth* **87**, 9985–9998. [2] Goudge T. A. et al. (2015) *Icarus* **260**, 346–367. [3] Rankin B. (2007). [4] Vane G. et al. (1993) *Remote Sens. Environ.* **44**, 127–143. [5] Murchie S. L. et al. (2009) *J. Geophys. Res.* **114**, E00D07. [6] Hook S. J. et al. (2001) *Remote Sens. Environ.* **76**, 93–102. [7] Christensen P. R. et al. (2004) *Space Sci. Rev.* **110**, 85–130. [8] Crowley J. K. (1993) *Remote Sens. Environ.* **44**, 337–356. [9] Baldridge A. M. et al. (2004) *J. Geophys. Res. Planets* **109**, DOI 10.1029/2004JE002315. [10] Carter J. and Poulet F. (2012) *Icarus* **219**, 250–253. [11] Rice M. S. et al. (2010) *Icarus* **205**, 375–395. [12] Güven N. and Kerr P. F. (1966) *Am. Mineral. J. Earth Planet. Mater.* **51**, 1056–1067. [13] Seelos K. D. et al. (2014) *Geophys. Res. Lett.* **41**, 4880–4887. [14] Vaniman D. T. et al. (2014) *Science (80-.).* **343**, 1243480. [15] Buz J. et al. (2017) *J. Geophys. Res.* **122**, 1090–1118. [16] Ehlmann B. L. and Buz J. (2015) *Geophys. Res. Lett.* **42**, 264–273. [17] HAY R. L. and MOIOLA R. J. (1963) *Sedimentology* **2**, 312–332. [18] Goudge T. A. et al. (2015) *J. Geophys. Res. Planets* **120**, 775–808. [19] Clark R. N. et al. (2002) *Proceedings of the 10th Airborne Earth Science Workshop*, pp. 1–2. [20] Edwards H. G. M. et al. (2004) *J. Raman Spectrosc.* **35**, 458–462.