MICROBIAL SIGNATURES IN SULFATE-RICH PLAYAS. M. Glamoclija[1], A. Steele[2], V. Starke[2], M. Zeidan[1], S. Potochniak[1] K. Sirisena[1,2] and I. H. Widanagamage[1], [1]Rutgers University-Newark, 101 Warren St, Newark, NJ 07102 (email: m.glamoclija@rutgers.edu), [2]Carnegie Institution of Washington, 5251 Broad Branch Rd, Washington, DC 20015.

Introduction: Martian surface-exposed sequences of sulfate-rich sedimentary formations are particularly interesting as they emphasize the importance of surface and near-surface aqueous processes during the planet's history. Playa/playa lake systems have received particular attention as the presence of Noachian/early Hesperian sulfate-rich deposits have been identified by the Mars Exploration Rover Opportunity at Meridiani Planum [1, 2] and by Mars Reconnaissance Orbiter (MRO) in sedimentary sequences within Gale crater [3, 4]. We are investigating playa systems from the White Sands National Monument (WSNM) in New Mexico as an excellent model system to study sulfate-rich evaporitic sequences that could help better understanding environmental parameters of playas, their potential for preservation of organics and exploration of biosignatures and habitability parameters that may be relevant for inferred playa deposits on Mars

Alkali Flat Settings: The White Sands' Alkali Flat includes sedimentary sequences that include a system of modern playas, which are a transient environmetns that include fresh to saline and hypersaline aqeous to dry desert settings. We have sampled shallow depth profiles (1.5 m) along the transect over the largest among modern playas (Lake Lucero) and transects with depth profiles along few drier playa locatins.

Results and Discussion: In our previous field campaigns near surface sediments from dune field had shown the presence of biofilm, and at some of the locations the surface had vesicular crust over green biofilm. However, this field sampling revealed no obvious presence of microbes within the sediments. The main characteristic of each sampling site was that top samples had very dry surface and the bottom samples are usually sampled at the groundwater table or near it. In this way the sampled profile includes samples from groundwater table (or capillary fringe) to the surface, which is the most geochemically active zone in this desert environment.

The surface samples of the playas are mainly composed of gypsum ($CaSO_4x2H_2O$) and mirabilite ($Na_2(SO_4)x10H_2O$) or thenardite ($Na_2(SO_4)$), some quartz (SiO_2) and halite (NaCl). Below the surface only gypsum and occasional halite were detected using powder X-Ray Diffractometer analysis.

Scanning Electron Microscope with Energy Dispersive X-Ray Spectroscopy (SEM-EDS) revealed only occasional presence of biological morphologies. Most of morphologies were found within the deposits of erosional escarpment and in the bottommost samples of the depth profiles.

The EDS analyses revealed high diversity of mineral precipitates within all of the samples. Interestingly, all of the samples (except surface samples) contained celestine. We have found in our previous study of surface dune field samples [5] that celestine was found only within thick biofilm at paleodunes site, which misled us to believe it was a potentially important as a mineral precipitated in microbial presence. However, now it is clear that celestine is present in all of the wet/moist samples and as they dry it gets blown away from the playa surface. We have found a diversity of magnesium precipitates through out the samples (Ca-Mg carbonates, hexahydrite ($MgCl_2xH2O$) or magnesium chlorite, epsomite ($MgSO_4x7H_2O$) etc.) which indicates that groundwater is likely Mg-rich. The high halite and mirabilite and lesser glauberite and epsomite presence points out the high-salinity content that microbes living here have to be able to overcome. The samples have further shown presence of clays, calcium carbonates, occasional presence of phosphor and potassium and carbon compound within salt precipitates.

Undergoing ion and nutrient analyses will help us understand major geochemical processes within upper meter of Alkali Flat playa deposits and reveal compounds that that may be indicative of microbial presence. The envirionmental data will be correlated with microbial metagenome data to obtain more realistic interpretation of potential chemical biosignatures.

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