WESTERN QAIDAM BASIN AS A MARTAIN ANALOG AND A NEW INTERPRETATION OF THE FORMATION MECHANISM FOR PITTED ROCK OBESERVED BY VIKING 2. Yu Sun[1,2], Yiliang Li[3], Hongping He[1], Wei Tan[1], Xiaoli Su[1,2], Aiqing Chen[1,2]. [1]Guangzhou Institute of Geochemistry, Chinese Academy of Sciences, No.511, Kehua Street, Tianhe District, Guangzhou, China (sunyu@gig.ac.cn), [2]University of Chinese Academy of Sciences, Beijing, China, [3]Department of Earth Sciences, The University of Hong Kong, Hong Kong (yiliang@hku.hk).

Introduction: The western Qaidam Basin in North Tibetan Plateau (Figure 1) has the most extreme arid environments on Earth and contains a series of ancient lakes that evaporated at different evolutionary stages during the rise of the Tibetan Plateau. Large quantities of salts and geomorphological features formed during the transition of warm-and-wet to cold-and-dry conditions provide unique references to study the modern Martian surface and interpret the data obtained by rovers and orbiters.

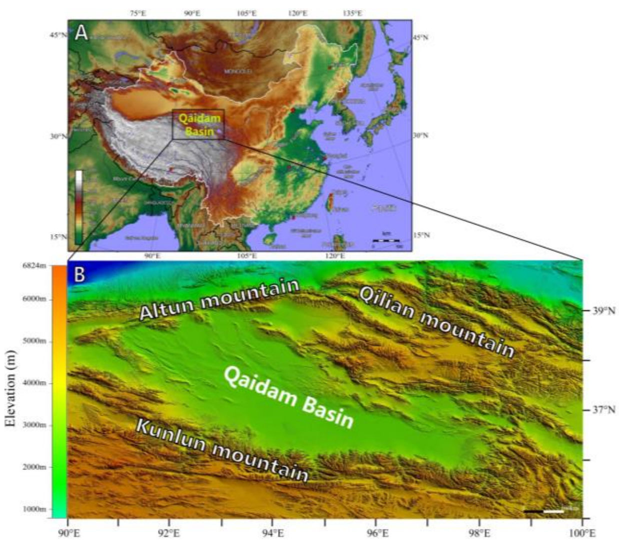

Figure 1. DEM maps showing the location of Qaidam Basin.

Former researches have presented numerous similarities and results of investigations that suggest the Qaidam Basin as a potential analog to study modern geomorphic processes on Mars, such as the catastrophic debris flows, polygonal terrains, yardangs and wind streaks and so on. In addition to these topographical similarities, survival strategies and biomarker conservation of microorganisms in extreme environments are of great significance for seeking life or biosignature on Mars. Many salt playas have undergone tens or even hundreds of thousands of years' evolution, leaving behind thick evaporite deposits. A detailed laboratory study of these samples will help us to understand what was going on in the similar martain evolutionary history and the preservation mechanism of biosignature. And the study of a specific analog can also help explain the formation mechanism of some micro structures in rocks or landforms observed by rovers.

During our fieldwork, we found locations very similar to the landing site of Viking 2 where pitted rock distributed in the arid desert randomly (Figure 2).

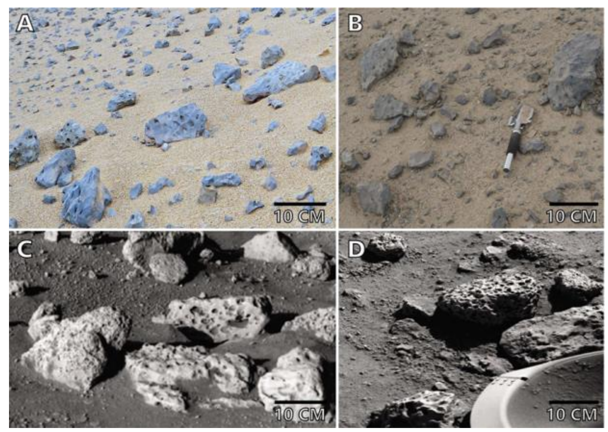

Figure 2. Images of pitted rock. A, B Pitted rock in Qaidam basin. C, D Pitted rock observed by Viking 2 on mars.

Several hypotheses have been proposed for the origin of these pits, including vesicles (formed by volcanic or impact processes), eolian pitting and fluting, differential weathering of minerals and clasts, salt weathering, water-assisted chemical weathering, and combinations of these. James W. Head (2011) found analogue in Antarctic Dry Valleys and explained that these pits were formed by very localized chemical weathering due to transient melting of small amounts of snow on dark dolerite boulders preferentially heated above the melting point of water by sunlight. Although melting of small amounts of snow may form pits above the rock, we can clearly see from the picture taken by Viking 2 that pits distributed in various positions on the rock.

Here, based on our sample, we suggest a new mechanism on the formation of these pits. The main component of our pitted rock is silicified dolomite, but observation with scanning electron microscopy reveal the presence of well-crystallized sheet-like kaolinite on the surface of feldspar grains, indicating a lowtemperature hydrothermal alteration. Carbonate can precipitate from salt lake, however, the presence of alteration minerals and the silication of dolomite signal a small scale of alteration during the evolutionary history of the paleolake. When carbonate and chert formed in the bottom of the lake, the fluctuation of the water body and sedimentary formed shallow pits on the surface of the carbonates. Alteration caused by hydrothermal fluid enlarged these pits and formed the pitted rock in the past. Our results suggest a relatively warm lake environment in the studied site and the similar environment on Mars that were suitable to sustain life.

References: [1] Anglés A, Li Y. (2017) *JGR*, 122. [2] Head J W, Kreslavsky M A, Marchant D R. (2011). *JGR*, 116(E9):-. [3] Wells N A. (1983) *Sedimentary Geology*, 35(4):263-296. [4] Browne P R L. (2003) *Annual Review of Earth & Planetary Sciences*, 6(1):229-248.