NEW INSIGHTS FROM UNMANNED AERIAL VEHICLE (UAV) COLLECTED HIGH RESOLUTION DATA INTO CHARACTERISTICS AND EVOLUTION OF WHALE-BACK YARDANGS IN QAIDAM BASIN, CHINA: POTENTIAL TO AEOLIAN RESEARCH ON MARS. Jun Huang[1,2], [1]Planetary Science Institute, China University of Geosciences (junhuang@cug.edu.cn), [2]Mars Space Flight Facility, Arizona State University.

Introduction: Yardangs are wind-eroded ridges from bedrocks and consolidated/semi-consolidated materials. They have been identified on Mars and in arid areas on Earth, providing important clues to climate and geology research. Tremendous yardangs occur in Qaidam basin, with various geomorphologic characteristics [1]. However, the geomorphology study has been carried out in two dimensions due to low spacial resolution of available topographic data. Here I show unprecedented centimeter-level Digital Elevation Model (DEM) and orthomosaic of several fields of streamline yardangs. These extremely high resolution data not only provide detailed geomorphology information and possible evolution clues of whale-back yardangs in Qaidam basin, but also have a great potential to aeolian research on Mars.

Methods: All the aerial images were collected with a DJI Phantom 4 during a field trip to Qaidam Basin from July 26th to August 5th 2017. The flight heights of this drone were 40-70 meters, and the Ground Sample Distance (GSD) of images vary between 1.7 and 3 centimeters. A Differential Global Positioning System (DGPS) instrument was used to get Ground Control Point (GCP) in two fields. Then Photoscan software was used to generate centimeter-level DEM and orthomosaic with Structure from Motion (SfM) algorithm. Data analysis was performed in ArcGIS.

Preliminary Results: Nearly all the whale-back yardangs are covered by a very hard crust, which contains chloride salts and sulfates. Polygonal features and gullies usually occur on the surface the yardangs, while consolidated transverse sand ridges lie between yardangs. In addition, vertical scarps related with seasonal fluvial activities are identified at the edge of some yardangs (Fig 1). The windward slope of some whale-back yardangs is not uniformly steeper than the leeward slope, and the side slopes can be different as well (Fig 2). Preliminary geomorphologic analysis also reveals relationship between whale-back yardangs and other types of yardangs.

Discussion: Halimov and Fezer [2] proposed a hypothetic development of yardangs in Qaidam Basin, including a path for whale-back yardang formation. Here I propose a new scenario: 1) Seasonal fluvial activities curved the channels out of pre-existed materials; 2) Mesa yardangs, long ridge yardangs and saw-toothed crests yardangs formed due to differeces in deposits properties and local topography; 3) Whale-back yardangs can form from all of them; 4) Seasonal fluvial activities and wind erosion remove the edges of the yardangs and transport the loose materials.

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References: [1] Xiao et al., 2016 ESR, 84-101; [2] Halimov & Fezer, 1989

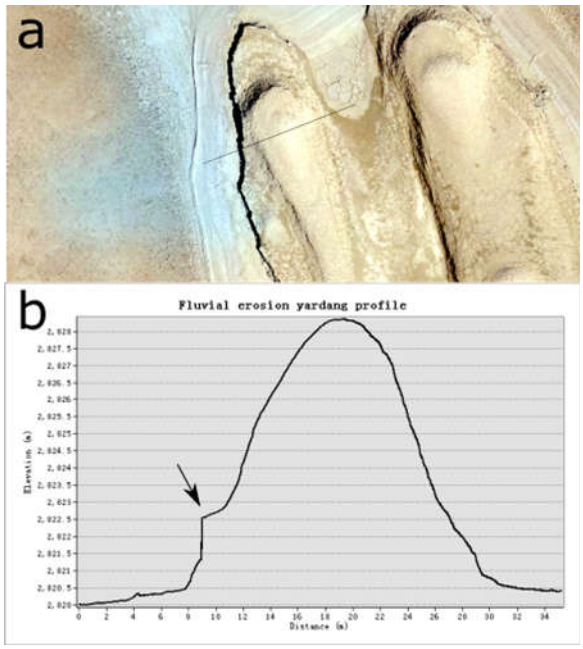

Fig.1 Vertical scarp of some whale-back yardangs

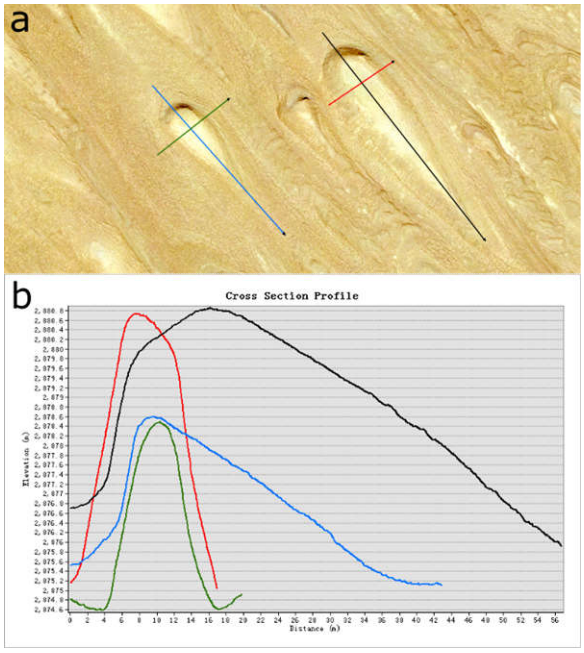

Fig.2 Cross section profiles