

MONITORING THE MOVEMENT OF SAND DUNES IN THE NILI PATERA CALDERA ON MARS

USING HiRISE IMAGES. W. Mubarak¹, H. Abouhaligah², and A. Abuelgasim^{1, 1}, College of Humanities and Social Sciences, United Arab Emirates University, Al-Ain, Abu Dhabi 15551, UAE, 201605270@uaeu.ac.ae and a.abuelgasim@uaeu.ac.ae ²(College of Science, United Arab Emirates University, Al-Ain, 15551, UAE 201630074@uaeu.ac.ae)

Introduction: On Earth, barchan sand dunes are formed over sand-covered firm soils in arid regions, where the wind blows predominantly in one direction and causes the sand particles to propagate accordingly. There is an inversely proportional relationship between dune size and migration rate. Also, solitary Barchan sand dunes tend to either expand or shrink caused by slight disturbances of their erosion/deposition equilibrium [1]. As generally known, the shrinking of complex dune fields rather occurs because of human encroachment such as construction and agriculture. Beyond that, dune migration processes at the Great Sand Dunes National Monument (CO, USA) were critically examined in the context of touristic activity [2].

Sand dunes on Mars are active under current conditions [e.g. 3]. Measurements have indicated Martian sand dunes in the Nili Patera area have unexpectedly high rates of movement similar to the dunes in Victoria Valley, Antarctica [4]. As illustrated from HiRISE imagery in Figure 1, the dunes in the Nili Patera Caldera are barchan large crescent-shaped dunes formed by the continuous blowing action from the winds. Sequences of HiRISE images indicate noticeable movement of these sand dunes from east to west.

This student research project contributes to investigating the growth and the movement of the Mars sand dunes in the Nili Patera area and suggests possible explanations for this phenomenon. We monitor the movement of Nili Patera sand dunes by analyzing HiRISE images with GIS techniques. The following HiRISE images are the basis of this study: PSP_004339_1890, ESP_022364_1890, ESP_028575_1890, ESP_035603_1890, ESP_057071_1890.

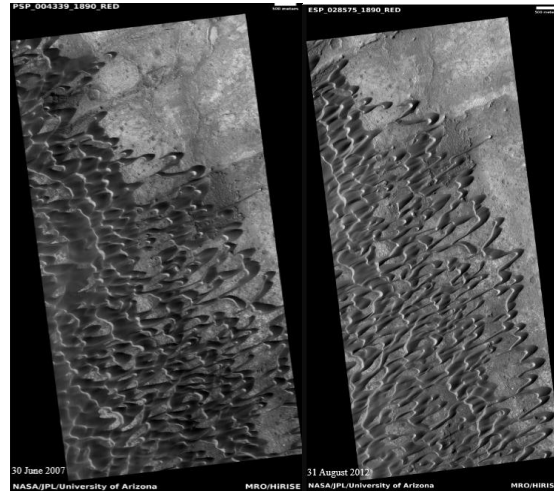


Figure 1: Images illustrating the evolution of sand dunes in Nili Patera caldera from 2007 and 2012. Image credit goes to NASA/JPL/University of Arizona [5, 6]

References:

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