MARE TYRRENIO REGION: ANALYSIS OF DARK SAND DUNES AND WIND DIRECTION INTERPRETATIONS. M. Cardinale¹ G. Komatsu¹ A. Pasulli², ¹International Research School of Planetary Sciences, Università D’Annunzio, Viale Pindaro 42, 65127 Pescara, Italy (cardinal@irsps.unich.it), ²Dipartimento di scienze, Università D’Annunzio, Viale Pindaro 42, 65127 Pescara, Italy.

Introduction: Dark sand dunes are widespread on the Martian surface and their morphology depends on wind regime and sediment supply [1]. The study of aeolian processes contributes to the understanding the climatic history of Mars. Recent studies, using high-resolution images, have allowed reexamination of the areas analyzed previously: investigations of dune fields unresolved by previous missions on a global scale [2]. In this work, we performed a detailed study of dark dunes on a regional scale in the Mare Tyrrenium region (MC22) (Fig. 1) comparing the observed morphology with a global atmospheric wind model.

Methodology and the study area: HRSC and THEMIS visible images, provide a useful coverage of the study area and the necessary spatial resolutions to identify dark ergs. HiRISE and CTX images allow us to resolve dune slip face orientations. All the datasets have been processed using ISIS and VICAR software and then integrated into a GIS project. We compare the observed morphologies with the NASA Ames Research Center General Circulation Model (GCM) [3]. The vectors associated with this model show winds with an associated surface stress of 0.025 Pa.

Results: We classified dunes according to the McKee classification [4]. Most of the observed ergs consist of barchans and transverse dunes. Star and linear dunes are also found in complex ergs [5], such as those in the Herschel basin, where two intra-crater dune fields (26-km diameter and 45-km diameter respectively) are influenced by a complex wind regime (Figs. 2-3). The orientations of dune slip faces and the trend of wind streaks [6] have been used to constrain the wind regime responsible for the accumulation of the studied ergs.

In the studied area, most of the observed slip face orientations, inferred by placing arrows on the reflected wind directions, agree with dominant wind directions from the west and from the north predicted by the GCM. On the other hand, dune slip face orientations in the complex ergs of Figs. 2-3, disagree with the GCM. This is due to the crater topography, which influences the main wind regime, leading to the development of local secondary wind flows.

Fig. 1. The Mare Tyrrenium region represented by the MOLA dataset in which the studied dune fields are marked with black triangles, while the red ones show the fields shown in Fig. 2 and 3.
**Conclusion:** We analyzed dune fields in the Mare Tyrrenium region of Mars with a focus on wind direction (Fig. 1). Our morphological analysis suggests that the observed crescentic dunes (barchan and transverse) located in simple topographic settings, are in agreement with the present-day atmospheric wind conditions predicted by the GCM. Complex ergs such as those of Figs. 2-3 suggest a more complex formation mainly influenced by topographically-induced local secondary wind flows. For this reason, they are not in agreement with the GCM. To understand the local dynamics of aeolian processes, and to understand the nature of the observed complex dune fields, we will try to compare these features with wind data from meso-scale wind models.

**References:**

**Fig. 2.** Complex erg (lat. 16°17′40.73″S, long. 128°25′20.08″E) shown in the CTX images P15_006974_1639_XN_16S231W, P15_006974_1639_XN_16S231W and the THEMIS image V07249003RDR in which the rose diagram represents wind directions inferred from dune slip face orientations in a downwind direction. The red square shows the HiRISE image illustrated in the Fig. 4.

**Fig. 3.** Complex erg (lat. 14°20′05.10″S, long. 128°37′33.84″E) shown in the CTX image P01_001396_1655_XI_14S231W. The rose diagram represents wind directions inferred from dune slip face orientations in a downwind direction.

**Fig. 4.** A close up the erg shown in the Fig. 2 from HiRISE image PSP_003638_1635.