ALIGNMENT OF FAULT SPRING MOUNDS AT EL-GUETIATE, SOUTHEAST TUNISIA: TERRESTRIAL ANALOGUE IMPLICATIONS FOR MARTIAN TECTONICS. E. Essefi1,2, G. Komatsu3, A. G. Fairén4, M. A. Chan5, C. Yaich1,2; 1National Engineering School of Sfax. 2RU: Sedimentary Dynamics and Environment (DSE); hocinef@yahoo.fr. 3International Research School of Planetary Sciences, Università d’Annunzio, Viale Pindaro 42, 65127 Pescara, Italy. 4Department of Astronomy, Cornell University, Ithaca NY 14853. 5Department of Geology & Geophysics, University of Utah, Salt Lake City, UT 84112.

Introduction: Considered so far as a stable domain [1], southeast Tunisia has been the subject of several paleo-climatic studies [2,3] documenting the sabkhas features. Here we present new field investigations and mapping to show important relationships of spring mounds and fault systems, to infer that the region has not always been tectonically stable. This Tunisia example demonstrates that characteristics and alignment of spring mounds can be important analogs for Mars to suggest recent tectonic activity.

Mapping of tectonic alignment: The orientation of the hydrographic network within the watershed of the El-Guetime, Tunisia (Fig.1a) shows two major alignments. The first orientation, N138, is in agreement with faults orientation in the south of the Sahel area [4]. The second orientation, N14, is conjugate with the first and has been discussed in many tectonic studies [e.g., 5]. Within the depression itself, fault spring mounds [6] are exposed in an organized way (Fig.1b). The sub-alignments of fault spring mounds N153, N163, and N123 are integrated within a major alignment oriented N143. This orientation is consistent with the results of previous studies [1,4,5].

Field observations: Spring mound formation is a continuous process [6,8] starting from the child stage (Fig. 2a) to reach the mature stage (Fig. 2a,b). Their alignments indicate that the terrestrial analogue of El-Guetime was far from being tectonically stable and in fact had multiple episodes of tectonic movements.

Magnetic properties: Our magnetic study shows that values of the magnetic susceptibility within the spring mounds are in the range of $60 \times 10^{-6}$. Magnetic susceptibility in the areas surrounding the spring mounds are in the range of $120 \times 10^{-6}$. Being half the magnetized value of its surroundings, these spring
mounds may be magnetically distinguished. Values along cores sampled along NW-SE and NE-SW profiles show the vertical succession of two sedimentary cycles. The first cycle in the upper parts is characterized by a downward increase of the magnetic susceptibility. This downward increase is due to a marine regression that produces more magnetic minerals. The second cycle reflects a marine transgression. It is worth noting the core C5 is more magnetized due to its proximity to the continent. The core C4 is the less magnetized due to a marine effect enhancing formation of diamagnetic minerals such as carbonate and gypsum. Radiocarbon dating [3] shows that these two cycles are dated to 5000 BP; this means that the faults responsible for the initiation of these spring mounds are due to the so-called Post Holocene deformation [9].


**Fig. 3.** Correlation and cyclostratigraphy along cores within a mature spring mound.

**Implications for Mars tectonics:** Fault spring mounds at El-Guetiate can be magnetically distinguished from their surroundings. This finding can be useful to differentiate and identify possible spring mounds and their tectonic alignments on Mars (e.g., aligned mounds in Arabia Terra). In addition, the orientations of hydrographic networks may help to infer tectonic activity where the spring mound alignments follow the major orientations of faults. The spring mounds also provide supporting data for interpreting remotely sensed mineralogy. Recognition of different spring mound stages of development and their relative dating is critical to determining the age of the tectonic activity, because the continuous process of spring mound formation typically starts early with initiation of the faulting.