POTENTIAL MARTIAN ANALOG SITES IN SOUTHEASTERN SPAIN. F. Rull[1], G. Venegas[1], F. Gázquez[1], J.M. Calaforra[2], J. Martínez-Frías[1], A. Sansano[1] and J. Medina[1], [1]Associated Unit to the Center of Astrobiology (CSIC) - University of Valladolid, Spain, [2]Water Resources and Environmental Geology Group – University of Almería, Spain.

Introduction: Hydrated sulfates have been detected on Mars using spectrometers onboard orbiter, as well as by two rover vehicles that are currently exploring the Martian surface. Thus, investigation on terrestrial sulfate deposits formed in similar conditions than those occurred on Mars in the past, is of considerable interest regarding the current and future exploration missions to Mars (MSL and ExoMars) [1].

The origin of most terrestrial hydrated minerals is bounded to the presence of liquid water, so research on these materials is essential to understand the genesis of the hydrated sulphates found on the Martian surface and their relevance for hosting astrobiological vestiges. In the present work, we propose three field sites in southeastern Spain in which hydrated sulfate minerals generated by hydrothermal and evaporative mechanisms are present.

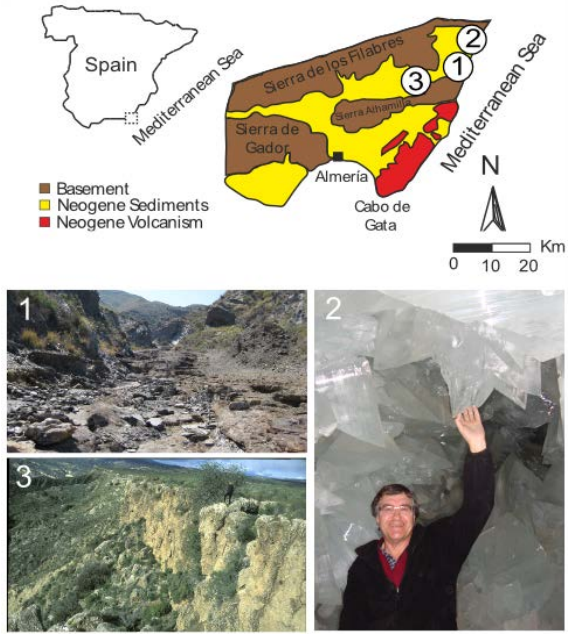

Fig 1. 1) Jaroso ravine; 2) Giant gypsum geode of Pulpí; 3) Gypsum karst of Sorbas.

Mission Description: ExoMars is the first ESA flag-ship mission of the Aurora program that will send a rover to the surface of Mars in 2018. The main goal of this mission is to identify the presence of past or present life on Mars. Characterization of minerals produced by water-related processes and identification of biomarkers linked to these forming mechanisms are of primary interest for this mission [2]. ExoMars is a combined mission of ESA in agreement with Roscosmos, in which the Martian subsoil -up to 2 m below the surface- will be sampled by means of a drill. Powdered samples will be analyzed by several techniques onboard the rover vehicle, including Raman and IR spectroscopy.

Scientific Merit: Volcanism in SE Spain during Messinian generated a hydrothermal system that produced alteration of earlier metamorphic materials and the precipitation of massive sulfate deposits. Among the minerals found in this area, jarosite and gypsum have become extremely interesting for research on Mars. In fact, jarosite was identified at Meridiani Planum on Mars by the MER Opportunity rover [3]. Jarosite and other hydrated sulfates in SE Spain have been found in the Jaroso Ravine, as well as in the mine that host the Giant geode of Pulpí. The origin of jarosite in this area attends to hydrothermal processes, so its study could help to understand the genesis of jarosite on Mars.

On the other hand, Ca-rich sulfates (probably gypsum) have been recently identified on the Martian surface [4]. Gypsum of hydrothermal origin has been found in the Jaroso Ravine, whereas the Giant geode of Pulpí hosts some of the largest gypsum crystals worldwide. Furthermore, the gypsum karst of Sorbas is one of the highlighted examples over the world of marine gypsum precipitation during the Messinian Salinity Crisis. Besides, the presence of caves turns the Sorbas basin into a suitable site for studying subsurface mechanisms of mineral precipitation, some of them mediated by microorganism which could be Martian analogs.

Logistic and environmental constraints of the field site: Jaroso and Sorbas areas are characterized by a good access to the outcrops. However, note that caves (both Pulpí and Sorbas) are protected sites, so non-destructive analyses and responsible sampling are essential. For this reason, license is required to access these sites.

References: [1] Martínez-Frías J. et al. (2006) Rev. Environ. Sci. Biotechnol., 5, 219–231. [2] Vago J. et al. (2006) ESA bulletin 126, 16-23. [3] Klingelhöfer G. et al. (2004) Science 306, 1740-1745. [4] Massé et al. (2011) EPSC VI, Paper 626.

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