

## Summary:

The team research focuses on the study of extreme environments, its biodiversity, limits of life and, by extrapolation, development of habitability potential in adverse environments. We have coordinated several field campaigns of astrobiological interest in studying different extreme environments.

The project M.A.R.T.E. (Mars Analogue Research and Technology Development) began in 2003 and extended until 2006. Its principal investigator was Dr. Carol Stocker of NASA Ames Research Center. This project was funded by NASA within NASA's ASTEP program for the development of technology for future space missions. This project was developed with the collaboration of several institutions in the United States and CAB. It consisted in the study of the subterranean environment of the zone of origin of the Tinto River (Huelva) where several perforations were made (160 m deeper) until reaching the anoxic zone isolated from the surface.

The ultimate goal of the project was the design and development of an automatic platform for drilling without direct human intervention (automatic drilling) on the surface of Mars.

This project was the beginning of research into the development of automatic drilling instruments for this purpose. It was developed in three phases: first and second year with non-automatic perforations and "in situ" study of the samples that were obtained in real time. In the third year, the automatic platform was implemented.

Another project of extreme environments with astrobiological interest was the international campaign to study the zone of origin of Tinto within the framework of the CAREX project. This project was an FP7 of the European Commission for the study of extreme environments. An approach campaign was designed using different study techniques (Raman, Mossbauer) contributed by different international teams that intensively studied the same samples (Gómez et al., 2011).

In the context of the Europlanet project (FP7 of the European Commission, 2009-2012), the planetary sciences were articulated at the European level with the intention of being competitive worldwide competing with the American planetary sciences. In the context of this project, several study campaigns of extreme environments were developed: saline environment of Lake Chott-El Jerid in Tunisia, simulation of a manned mission to Mars in the extreme environment of Rio Tinto, study of active volcanism environments of the Kamchatka peninsula in Russia, campaign to the cold environments of the island Svalbard in the Arctic. All this coordinated by Dr. Felipe Gómez, having been the coordinator of the actions on terrestrial analogues of the Europlanet project.

The Europlanet project has been approved for funding under the Horizon 2020 program for the period 2016 to 2019. New sites to be explored have been included as Danakil depression in Ethiopia. Other campaigns of astrobiological interest: Antarctica (Deception Island) and Atacama Desert in Chile.