THE MOONWALK PROJECT: PREPARING FOR HUMAN SUPPORTED SCIENCE ON MARS AND THE MOON. V. Parro[1], F. Puente-Sánchez[1], T. Vögele[2], B. Imhof[3], B. Davenport[3], P. Weiss[4], D. Urbina[5], K. Fossum[6], A. Nottle[7], M. Höckelmann[2], T. Hoppenbrouwers[5], V. Taillevot[4], W. Hoheder[3], O. Prieto-Ballesteros[1], [1]Centro de Astrobiologia (CAB, INTA-CSIC), Madrid, Spain, puentesf@cab.inta-csic.es, [2]Robotics Innovation Center, DFKI, Bremen, Germany; [3]LIQUIFER Systems Group, Vienna, Austria; [4]COMEX S.A., Marseille, France; [5]Space Applications Services, Zaventem, Belgium; [6]CIRiS, NTNU Samfunnsforsking, Trondheim, Norway; [7]Airbus Group Innovations, Newport, Wales.

Introduction: The final goal of the Global Exploration Roadmap from the International Space Exploration Coordination Group is the development of sustainable human missions to explore other planets and moons [1]. While current rover missions are greatly expanding our knowledge on Mars habitability, manned exploration will provide unprecedented opportunities for in-situ science and sample retrieval. Due to the complexity of extravehicular activities (EVA) in planetary exploration, it is necessary to conduct extensive procedural testing in order to prepare for future missions. MOONWALK is a project funded by the European Union FP7 programe with the aim of creating in Europe the capability of simulating EVA Activities, as well as studying scenarios for Astronaut – Astronaut and Astronaut – Robot cooperation for surface exploration.

MOONWALK project will develop and validate concepts, operations and technology for future exploration missions. This includes the development of technologies for astronaut-rover cooperation and wearable man-machine interfaces, as well as a European EVA training spacesuit representative of future EVA suits. All this technology will be tested and validated by field campaign simulations for low gravity (under sea water in Marseille, France) and a full astrobiological campaign to the Rio Tinto (southwestern Spain) Mars analogue [2]. In the Rio Tinto campaign there are three main objectives: (i) simulate safety procedures and evaluate the habitability conditions and human settlement; (ii) evaluate the near geo-mineralogical resources and in-situ exploration of a hypothetical Martian landing site; and (iii) astrobiological exploration through scientific EVA operations. To achieve these objectives different EVA tasks will be necessary, such as scouting, geological and mineralogical studies, environmental monitoring (T, wind speed), exploring difficult access areas such as slopes, trenches and caves, sampling and astrobiological science measurements. In addition, communication delays with the operation and scientific centers will be simulated.

These EVA tasks will be carried out by cooperation between an astronaut and a robot assistant. We have designed several scenarios that could occur in an actual manned mission to Mars (Figure 1). The scientific operations will include geomineralogical mapping and in-situ surveys by robot-portable Raman spectroscope. Samples will be taken back to a planetary habitat simulator to be analyzed by a life detection instrument platform (Signs Of Life Detector, SOLID) [3]. The integration of geomineralogical and astrobiological data, together with orbital signatures, will allow the scientific team to formulate hypotheses on the past and present habitability of the selected sites, and determine the best candidates for a hypothetical sample return to Earth for further analysis.

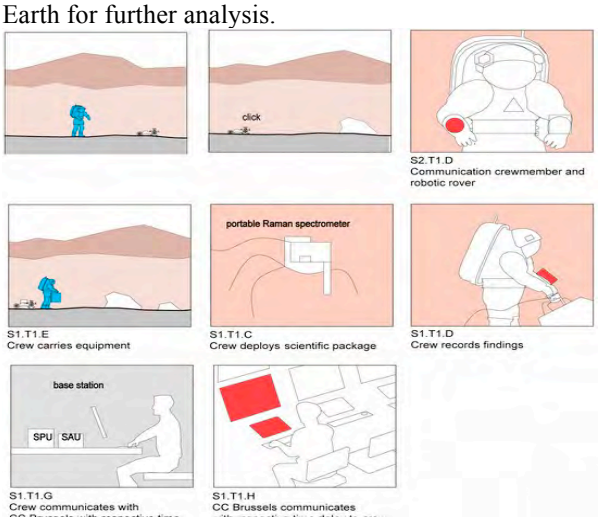

Figure 1: Examples of some of the scenarios for the Rio Tinto Mars analogue sampling campaign.

References: [1] Hufenbach B. et al. (2011). *62nd International Astronautical Congress*. [2] Amils R. et al. (2014) *Life*, *4*, 511-534. [3] Parro V. et al. (2011) *Astrobiology*, *11*, 15-28.

Additional Information: MOONWALK is a EU FP7 project Grant Agreement No. 607346.