HABITABILITY OF MARS, ENCELADUS, EUROPA AND TITAN – CHALLENGES IN ASTROBIOLOGY AND PLANETARY RESEARCH. Jean-Pierre de Vera[1] [1]German Aerospace Center (DLR), Institute of Planetary Research, Rutherfordstr. 2, D-12489 Berlin, Germany

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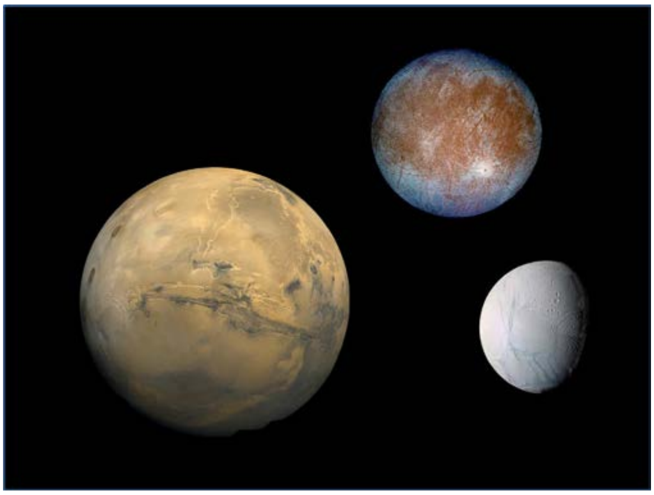
Introduction: One of the main challenges in astrobiology and planetary research in the near future is to realize space missions to study the habitability of Mars and the icy moons of the Jovian and Saturnian system. Mars is an interesting object to search for fossilized life because of its much more water driven wet history of its past. River beds, sedimentary deposits indicating the presence of lakes [1] as well as a supposed but highly debated presence of a former ocean on the north hemisphere [2] are clearly showing that the atmosphere must have been much denser and the conditions much more habitable than nowadays. Even today still water activity is present in specific niches on the surface of Mars [3]. This leads to the conclusion that the search for habitable environments on Mars and the presence of bio-traces of extinct or extant life is a reasonable enterprise to be conducted in the next space missions. But Mars is not the only promising candidate to find life in our solar system. The icy moons, like the Jovian moon Europa where water driven resurfacing activity must regularly happen because of the low amount of impact craters on the icy crusts as well as the clear observations of cryo-volcans and fissures and cracks with colored deposits coming from the inner side of a global ocean are clearly showing, that the ocean can be a habitable environment [4]. The Saturnian moon Eneladus seems also be a promising candidate to search for life. On this moon high water plumes come out of an ocean covered by its ice crust [5]. Some observations by the probe of Cassini also have shown, that besides the presence of water and salts a high number of simple and complex organics was observed within these plumes. Also for the Saturnian moon Titan an ocean is supposed beneth the icy crust and this moon has not to be neglected in future astrobiology-driven exploration missions. Because of these very important observations of the last decades international and interdisciplinary scientific teams are working on new types of space missions with the main task to search for life including work performed in planetary analog field sites, work in the lab and analysis performed in planetary simulation facilities combined with research done in space on specific exposure facilities as there are satellites and the International Space Station (ISS). The technology developments and scientific approaches try to solve problems which might occur if we would like to detect life. For that technology is used and tested in planetary analog environments like in the deep sea as well as in dry and cold deserts and different life detectors are developed and used during these field campaigns before testing them in space and using further in the next space exploration missions to Mars and the icy moons. Taken into account the international planetary protection guidelines which clearly formulate to first prevent contamination of a planets and moons and their special regions which might be habitable before sending probes on the surface, important work for cleaning and sterilizing the complex technology is necessary and sometimes a big challenge for engineers to fulfill these guidelines.



Figures: Promising habitable objects in our solar system: Mars, Europa and Enceladus. Are there niches which are colonized at least by microorganisms?

References:

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