Space Laboratory, Space Station and Space Exploration (2)
Space Laboratory, Space Station and Space Exploration (2)

Author: Ms. Heleen Vos
ESTEC, European Space Agency, The Netherlands

USING SPECTROMETRY TO DIAGNOSE MOONMARS & ASTEROIDS ROCKS, WATER AND PLANTS

Abstract

Spectroscopy is being used, amongst others, by satellites to analyse the surface of the Moon and Mars. By doing laboratory experiment we try to determine the spectrum characteristics of certain elements, minerals and rocks, but also the presence of water and organisms. For the measurements the spectrometer USB4000 was used which measures in the UV/VIS spectrum. The advantages of laboratory measurements are the stable settings and a strong light source which results in minimal noise. Even though there are absorption and reflection bands that can be related to elements, the identification of a surface based on the UV/VIS spectrum is still very restricted. Also the presence of water is detectible in the UV/VIS spectrum, but meets is limits when it is present in small amounts on rocks or minerals due to water-crystal interactions.

Several measurements were repeated during field campaigns in the Eifel in Germany which were done in the context of an ILEWG EuroMoonMars campaigns. The spectrometer was installed on the ILEWG ExoGeoLab lander and remotely controlled during the Extra-vehicular Activities (EVAs). During these field experiments complications in the spectroscopy analyses were disclosed. Especially the change in weather conditions and the lack of a strong reference spectrum can influence the reliability of the measurements.

A third part of this study consisted of the analyses of the health and nutrients in a plant. Sequences of seeds were planted on different soils and on a Moon analogue regolith after which the spectrum and growth of these plants were analysed. The influence of the soils, the presence of microorganisms and the nutrients in a plant can be detected in a UV/VIS spectrum and could be used in future greenhouses for automatic health analyses.