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MINIATURIZED SPECTROMETER FOR IN-SITU EXPLORATION OF PLANETARY SURFACES

Abstract

Here we propose an in-situ instrument to identify minerals and/or ices present on a planetary surface at microscopic scale. The concept is a modular, miniaturized instrument with a high TRL. It consists of different elements (VIS-NIR spectrometer, optical head, fibers, calibration target) that can be deployed on different parts of a rover/platform. The VIS-NIR spectrometer itself is detached from the optical head and can be accommodated in a box on the rover/platform and fed by optical fibers. The optical head can be accommodated on a mast, arm or similar. An alternative way is to mount the spectrometer optical head on the rover/platform baseplate with an unobstructed view. In case of a drill, the instrument can observe at the point where tailing piles from the drill are deposited. It can obtain data at different station points during roving or drilling activities. The data have crucial information to assess the composition (minerals and/or ices) of the site at a scale of millimeters or less. The heritage comes from Ma_MISS on the ExoMars Rosalind Franklin rover where the micro spectrometer (located in a box outside the ExoMars

drill) is detached from the optical head (inside the drill) and they are linked with optical fibers. With a spectral range from about 500 nm to 2400 nm consisting of several bands (> 100) to resolve diagnostic features of materials and a spatial resolution of about 150 micron to investigate the surface texture, the concept we propose is suitable to discriminate a wide variety of rock-forming minerals and ices and study many crystalline components providing a comprehensive analysis of planetary surfaces.

The instrument is a key element for determining planetary surface composition at microscale. In situ measurements are essential to provide information on planetary materials addressing many scientific objectives, from the formation and evolution of a given solar system solid body to the selection of interesting sample and site for resources utilisation.