SOFFEN CRATER IN THE TERRA CIMMERIA REGION OF MARS. C. Gross[1] , M. Sowe[1], Freie Universität Berlin, Inst. of Geological Sciences, Malteserstr. 74-100, 12249 Berlin, Germany, christoph.gross@fu-berlin.de.

Introduction: Soffen impact crater is a 58 km large complex impact crater and centered at 23.5° S, 140.8°E on Mars. We investigate phyllosilicate detections returned by the Compact Reconnaissance Imaging Spectrometer for Mars (CRISM) onboard Mars Reconnaissance Orbiter (MRO). The objective is to identify several types of phyllosilicates and other hydrated minerals in order to test the hypotheses of impact induced hydrothermalism versus excavation models. Our special focus is on prehnite because it is a phyllosilicate that forms in the presence of water at high temperatures. The detected phyllosilicates are concentrated within the central peak of the crater in close association to major faults of the uplifted blocks around a kidney-formed depression.

Geologic Setting and Study Area: The Terra Cimmeria region is part of the old, heavily cratered southern highland region of Mars. Compared to surrounding craters, Soffen is relatively well preserved, showing a sharp rim and some terraced walls (Fig. 1). The crater floor shows a smooth topography and appears to have been partly filled by wind-blown sediments. The central peak looks strongly brecciated and faulted and is bounded to the east by a 6 x 4 km large depression, forming a central pit suggesting the presence of volatiles in the subsurface [1, 2].

Data Sets and Methods: Visual interpretations were carried out using the available HRSC, CTX, HiRISE and THEMIS data. Image processing was conducted in ISIS3 environment and the mapping in ESRI's ArcGIS. The digital elevation model-mosaic was derived from HRSC observation H6415 and HA544. CRISM interpretation was carried out using the CRISM Analysis Toolkit (CAT) and ENVI that includes reduction of instrumental and atmospheric effects and conversion to I/F reflectance. We focused our spectral analyses in the 1-2.6 µm wavelength range where hydrated minerals such as phyllosilicates exhibit representative absorptions. We used FRT0000940B with a spatial resolution of 18 m/px. Spectra were collected for 4 x 4 pixel spots and ratioed in column to emphasize the mineral features (Fig. 2). Laboratory spectra of the CAT RELAB have been used for comparison with the Martian spectra.

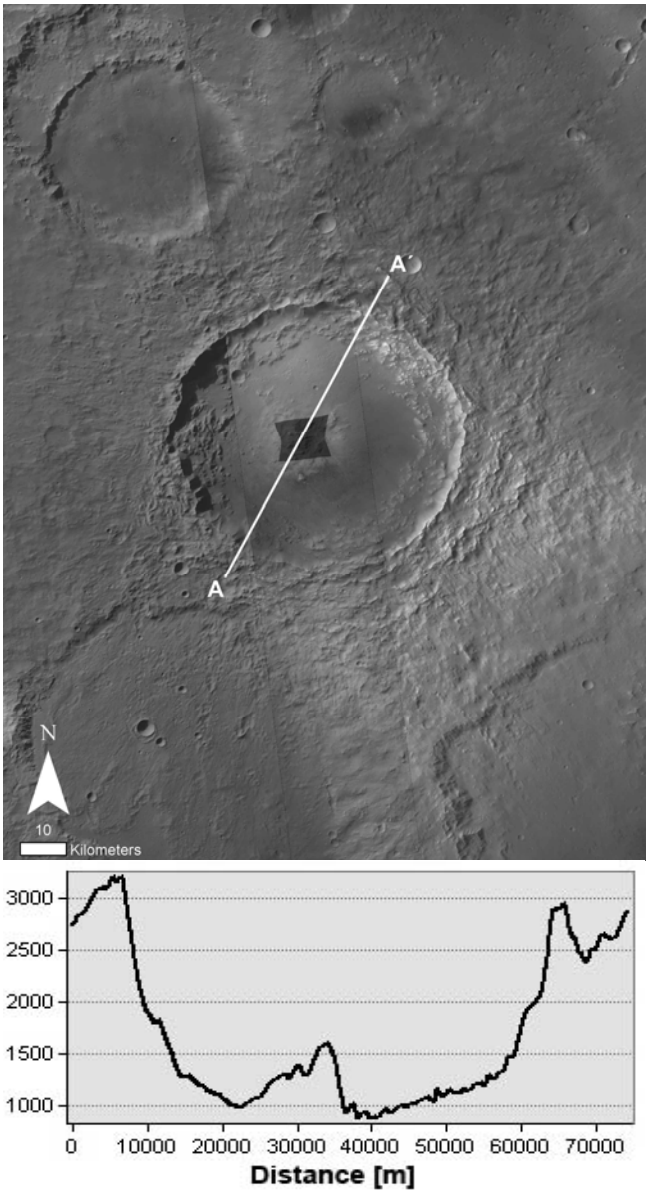

Figure 1: HRSC mosaic of Soffen impact crater and surrounding highlands. Observation H6415 and HA544 with CTX P15_006789_1563 overlay. CRISM footprint and morphologic profile A-A' covering the central peak.

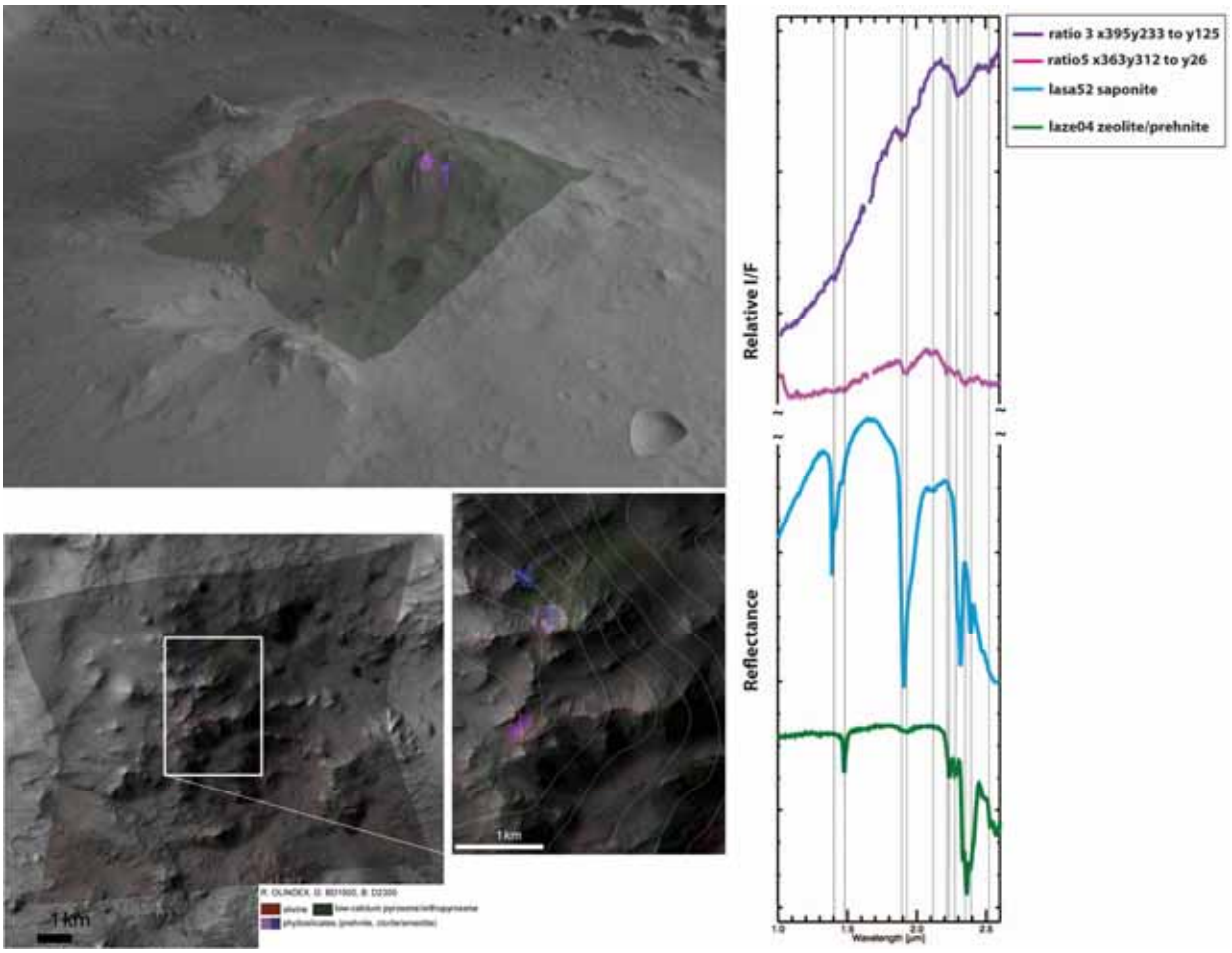

Figure 2: CRISM I/F spectra of hydrated minerals draped on CTX observation P15_006789_1563_XN_ 23S219W. Oblique view of central peak and pit, view towards the southeast (top) and close-up of the central peak area (bottom). Lab spectra of phyllosilicates that best match the hydrated outcrops (right).

Preliminary Results: A strong D2300 parameter has been identified in the CRISM observation, indicating the presence of phyllosilicates. Some light-toned ridges of the central peak coincide with high calcium pyroxene (HCP) -rich regions. Other light-toned ridges of the central peak show a strong olivine index (OLINDEX). Both indices are exposed on the slope of the central peak. In general, a weak low calcium pyroxene (LCP) index is observed. Spectral absoptions occur at the following wavelength: 1.91, 1.98, 2.09, 2.28, around 2.34 and 2.47 µm, overall best matching with prehnite. These strong phyllosilicate detections are located close to a kidney-formed depression (see Fig. 2). Here, a light-toned material can be observed.

The northernmost phyllosilicate detection (see Fig. 2 close-up) appears at a blocky outcrop. Eroded material can be followed downhill, fanning out at greater depth. All detected phyllosilicates have in common that they presumably crop out in close association to major fault patterns of the central uplift.

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