MINERALOGICAL MAPPING OF THE KERWAN QUADRANGLE ON CERES. E. Palomba^{1,2}, A. Longobardo¹, M. C. De Sanctis¹, A. Galiano¹, F. G. Carrozzo¹, F. Zambon¹, A. Raponi¹, M. Ciarniello¹, E. Ammannito^{3,1}, K. Stephan⁴, D. Williams⁵, M. T. Capria¹, S. Fonte¹, M. Giardino¹, F. Tosi¹, C. A. Raymond⁶, C. T. Russell^{2,1} INAF-IAPS Istituto di Astrofisica e Planetologia Spaziali, Rome, Italy (ernesto.palomba@iaps.inaf.it), ²ASDC-ASI, Rome, Italy, ³University of California at Los Angeles, Los Angeles, CA, USA, ⁴DLR, Berlin, Germany, ⁵ASU, Arizona, USA, ⁶NASA/Jet Propulsion Laboratory and California Institute of Technology, Pasadena, CA, USA.

Abstract: This work describes the mineralogical mapping of the Kerwan quadrangle of Ceres, extending from latitude 22°S to 22°N and from longitudes 72°E to 144°E.

Introduction: The Dawn/NASA mission started to orbit around dwarf planet Ceres in April 2015 [1] and since then color and hyperspectral images are acquired, using the Framing Camera (FC) [2] and the Visual and InfraRed spectrometer (VIR), respectively [3].

Images and data revealed Ceres as a surface dark object characterized by an average reflectance (estimated with a phase angles of 30°) of 0.03 [4] and some brighter localized areas. The presence of absorption bands at 2.7 μm and 3.05 μm in reflectance spectra, due to OH and NH_4 respectively [5], suggested the existence of ammoniated phyllosilicates widespread on the surface. Carbonates are also supposed to be present on Ceres surface, because of the presence of 3.4 μm and 3.9 μm absorption bands. Deeper absorption of carbonates features suggest a much larger abundance in bright spots [6], while the excess of 3.4 μm band depth observed in few restricted areas reveals the occurrence of organics [7].

The Ceres surface has been divided in 15 quadrangles [8], in order to better analyze dwarf planet and investigate its geological and mineralogical properties.

This work concerns the mineralogical mapping of the Kerwan quadrangle, spanning from latitude 22°S to 22°N and from longitudes 72°E to 144°E.

Dataset: VIR data acquired during the phase mission of Approach, Rotational Characterization, Survey and High Altitude Mapping Orbit have been used in the following analysis, with a space resolution ranging from 0.38 km to 1.1 km. VIR spectra covers a wavelength range from 0.2 to 5.1 μm and spectral artifacts have been properly removed [9].

The analysis of Kerwan quadrangle is based on the following spectral parameters: 3.05 μm band depth; photometrically corrected 2.7 μm band depth [10]; albedo and reflectance, (estimated at 1.2 μm and with a phase angle of 30°) obtained applying a photometric correction [1,10].

The analysis based on other spectral parameters, such as spectral slope and band centers is in progress.

Results: The geologic map of the quadrangle is shown in Figure 1, whereas the map of albedo at 1.2 μm , band depth at 2.7 μm and band depth at 3.05 μm are shown in Figures 2, 3 and 4, respectively.

The quadrangle is characterized by four main areas:

- The Kerwan crater and related ejecta, located southward of 0° latitude and at longitudes larger than 110°E. This is a relatively young feature [11];
- Dantu crater, in the northern-easter part of the quadrangle, which has been generated by the most recent impact occurred on Ceres;
- Inamahari and Homshuk craters, in the northern-western part of the quadrangle;
- Cratered terrains, the oldest of the quadrangle, in the southern-western part of the quadrangle.

As observed in other equatorial quadrangles (e.g. [12], [13]), a correspondence between age and 3.05 μm band depth arises. In particular, ejecta from Dantu, Kerwan and Inamahari show very deep absorption due to ammoniated species. This agrees with the fact that these ejecta are composed from underlying material, characterized by deeper band. The low spectral slope of these areas (e.g. [14]) gives a further evidence of the freshness of this material.

Dantu and Inamahari craters show also a very low 2.7 μm band depth, indicating that dehydration could have been occurred during the impacts.

Figure 1. Geologic map of the Kerwan quadrangle (from [11])

Figure 2. 1.2 μm albedo map of the Kerwan quadrangle, overlaid on the FC map.

Figure 3. Photometrically corrected band depth at 2.7 μm band depth map of the Occator quadrangle, overlaid on the FC map.

Figure 4. Band depth at 3.05 μm band depth map of the Occator quadrangle, overlaid on the FC map. Peculiar regions of the quadrangle are highlighted.

Acknowledgments: VIR is funded by the Italian Space Agency (ASI) is managed by INAF-Istituto di Astrofisica e Planetologia Spaziali, Rome-Italy. The instrument was built by Selex-Galileo, Florence-Italy. This work was supported by ASI and NASA.

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