SURFACE COMPOSITION OF CERES QUADRANGLE AC-4 EZINU BY THE DAWN MISSION. J-Ph. Combe1, S. Singh1, K. E. Johnson1, T. B. McCord1, M. C. De Sanctis2, E. Ammannito2,3, F. G. Carozzo2, M. Ciaraldi2, A. Frigeri2, A. Raponi2, F. Tosi2, F. Zambon2, J. E.C. Scully4, S. Ieva5, M. Fulchignoni6, C. A. Raymond4, C. T. Russell3, and the Dawn/VIR Team, 1 Bear Fight Institute, Winthrop, WA, USA. 2 INAF-IAPS Istituto di Astrofisica e Planetologia Spaziali, Rome, Italy. 3University of California at Los Angeles, Los Angeles, CA, USA. 4NASA/Jet Propulsion Laboratory and California Institute of Technology, Pasadena, CA, USA. 5INAF-Osservatorio Astronomico di Roma, via Frascati 78, 00040, Monte Porzio Catone, Roma, Italy. 6LESIA - Observatoire de Paris, CNRS, Université Pierre et Marie Curie, Université Paris Diderot, F-92195 Meudon, France

Introduction: The objective is to determine the surface composition of Ceres quadrangle Ac-4 (22°-66°N; 180°-270°E) using remote-sensing data from the Dawn mission [1-2] and interpret the geological and physical processes that can explain the observations. This quadrangle takes its name from the crater Ezinu (the largest within the limits of this region). We focus on the following topics.

1- Perform an analysis of the composition of fresh craters in order to detect possible variations between the craters and to determine whether the composition of fresh craters is representative of the rest of the surface.

2- Investigate whether the H2O-rich area is associated to a distinctive mineralogy, and make comparisons with other areas where H2O has also been found [3-7].

3- Measure the extent of ejecta from Occator and compare the results with those from geological mapping [7].

Results: The surface of this quadrangle is heavily cratered [7] (Fig. 1A). Because of that, the northernmost regions include deep shadows, especially the north-facing wall of fresh impact craters, which is a limitation when interpreting images and reflectance spectra.

The albedo calculated from images acquired by the Framing Camera (FC) is a very uniform within this quadrangle (Fig. 1B), with a few exceptions: 1) Low-albedo materials that are likely ejecta from the northern rim of Occator and from other small craters including one inside Ezinu, 2) Small areas with albedo higher than average including the southern rim of Ezinu and one fresh crater (unnamed) at 61.4°N, 221.5°E. In addition, that particular crater contains H2O-rich materials [4] that are associated to mass-wasting.

The Red-Green-Blue color composite of FC ratio images (Fig. 1F) enhances the natural colors of Ceres’ surface (blue indicates positive spectral slope and red negative spectral slope). The surface covered by Ezinu quadrangle shows a diffuse dichotomy, approximately parallel to the equator, between more blue materials in the south and more red materials in the north. More red materials are found systematically at higher latitude, while equatorial regions have a lot of spectral diversity. The blue materials in Ezinu quadrangle are mostly associated to a large area around Occator, which possibly indicates the extension of ejecta. A few exceptions exist:

- Extremely red materials in the northeastern rim of Occator and several other areas within craters in the north of the quadrangle.
- High albedo materials (green in the map) on the wall of several craters in the north.

The 2D scatter plot of absorption band depths at 2.7 µm and 3.06 µm in quadrangle Ac-4 shows also a positive diffuse correlation, with a single population. This indicates certain surface components are not represented within the Ezinu quadrangle. The 3.06 µm absorption band depth is relatively weaker compared to the rest of the surface of Ceres, and that the composition is mostly uniform. Northeastern ejecta from Occator constitute the most obvious exception, with a strong 2.7 µm band and a moderately strong 3.06 µm absorption band, in contrast with the floor of Occator.


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Fig. 1: Maps of the Ac-4 quadrangle (Ezinu) in Lambert conformal conical projection. A – Low-Altitude Mapping Orbit mosaic from the Framing Camera (FC) clear filter. B – High-Altitude Mapping Orbit mosaic from FC clear filter with photometric correction applied. C – 2.7 μm absorption band depth of OH in phyllosilicates measured by VIR. D – 3.06 μm absorption band depth of OH in ammoniated phyllosilicates measured by VIR. E – Two-dimension scatter-plots of the 3.06 μm absorption band depth versus the 2.7 μm absorption band depth. The colors show the comparison of the compositional properties of the Ezinu quadrangle (in blue) superimposed on those of the entire surface of Ceres (in magenta). F – Color composite of FC band ratios that enhances the colors in the visible of the surface of Ceres (blue means more negative spectral slope and red means more positive spectral slope). Red: 440/750 nm; Green: Albedo at 750 nm; Blue: 750 nm/440 nm.