COMPOSITION OF THE URVARA-YALODE REGION ON CERES. E. Ammannito[1], M.C. DeSanctis[2], F.G. Carrozzo[2], F. Zambon[2], M. Ciarniello[2], J-P. Combe[3], A. Frigeri[2], A. Longobardo[2], A. Raponi[2], F. Tosi[2], S. Fonte[2], M. Giardino[2], K. Hughson[1], L.A. McFadden[4], E. Palomba[2], J. Scully[6], K. Stephan[5], C. A. Raymond[6], C. T. Russell[1] and the Dawn Science Team. 1) University of California Los Angeles, EPSS, Los Angeles, CA. USA, 2) Istituto Nazionale di Astrofisica, IAPS, Rome, Italy. 3) Bear Fight Institute, Winthrop, WA, USA. 4) NASA, GSFC, Greenbelt, MD, USA. 5) Institute of Planetary Research, DLR, Berlin, Germany. 6) Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA, USA.

Introduction: We present here the first results of the mineralogical mapping of the Urvara and Yalode quadrangles on Ceres. These two quadrangles define a region in the southern hemisphere between latitudes 20°S and 65°S and longitudes 180°E and 360°E.

The mineralogical mapping is mainly based on the acquisitions made by the spectrometer VIR [1] on board the Dawn spacecraft [2].

The average thermally corrected reflectance spectrum of Ceres is compatible with the presence on Ceres' surface of a mixture of ammoniated-phyllosilicates, Mg-phyllosilicates, carbonates, and dark materials [3]. A strong 2.72 μm absorption dominates the overall spectral properties, it has been attributed to OH-stretching vibrations in phyllosilicates [4] while the weaker 3.06 μm absorption has been attributed to the presence of ammonium in phyllosilicates [5]. We focus here on the distribution of these two absorption bands within the Urvara-Yalode region.

To compute the position and intensity of the 2.72 μm and 3.06 μm absorptions, we used here the same processing adopted in [6]. Fig. 1-3 show the distribution of few relevant parameters of this region: a clear filter mosaic (fig. 1), the intensity of the 2.7μm band (fig. 2) and the intensity of the 3.1μm band (fig. 3).

Discussion and conclusion: The morphology of this region is dominated by the two impact craters Urvara (45°S and 249°E, diam: 170Km) and Yalode (42°S and 292°E, diam: 260Km). The catenae here present (Gerber, Pongal and Baltay) seem to be associated with the formation of these impacts although these features do not have a clear correlation with composition.

The region studied here lacks any significant variability both in the albedo and in the spectral slope (maps not shown). In fact, the main variabilities are associated with topographic features that have not been properly compensated with the photometric correction. On the contrary, both the 2.7 and 3.1 μm absorption features have a clear variability of their intensities. The consequent absence of correlation between the intensity of the bands and the albedo/slope is an argument in favor of the interpretation that the intensities are likely associated with a change in the abundance of phyllosilicates as already noted for the global maps [5].

The northern part of the region studied here is dominated by smooth material and seems to have lower concentration of phyllosilicates while the southern is more cratered and rough and has more clays in particular in the terrains left of Urvara.

While at global scale there is a correlation between the distributions of OH and NH_4 [5], in this region such correlation is not so clear. The main peculiarity is a positive anomaly in the presence of NH_4 –rich phyllosilicates within Urvara. In general, Urvara crater has a complex distribution of phyllosilicates. The region on the right of the central peak is depleted both in OH and NH_4 (blue in fig. 2 and 3), while on the left of the peak is localized the NH_4 -rich deposit which however does not correspond to an enrichment in OH (bright in fig 3 but average in fig. 2). A similar dichotomy is replicated in the rim on the left although the contrast in the OH abundance is less pronounced. Interestingly, the same dichotomy in the concentration of OH and NH_4 is present in Consus crater (21°S and 200°E, diam: 64Km) where it seems to be associated with a younger crater in the floor. Yalode crater has a more complex correlation between the morphology of the crater itself and the distribution of phyllosilicates; in general small fresh craters within Yalode are associated with a depletion of both OH and NH_4 while there is a lack of enrichments.

The nature of the enrichments and depletions in OH and NH_4 present in the Urvara-Yalode region are still under investigation but they are most likely explained with heterogeneities within the most external layer of the crust.

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

References: [1] De Sanctis, M.C. et al. Sp. Sci. Rev. 163, 329–369(2011). [2] Russell, C.T. & Raymond, C.A. Sp. Sci. Rev. 163, 3–23 (2011). [3] De Sanctis, M.C. et al. Nature 528, 241-244 (2015). [4] Bishop, J.L. et al. ClayMiner. 43, 35–54 (2008). [5] Bishop, J.L., et al. Planet. Space Sci. 50 (2002). [6] Ammannito. E. et al. Science 353, 6303, aaf4279 (2016).

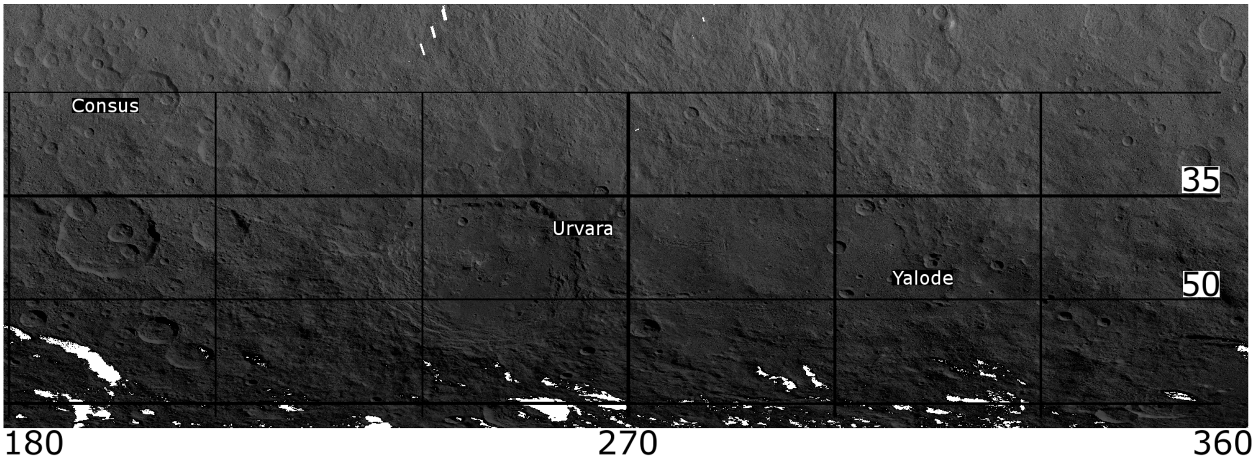

Fig. 1 Clear filter mosaics of the Urvara-Yalode region (credit: NASA/JPL-Caltech/UCLA/MPS/DLR/IDA)

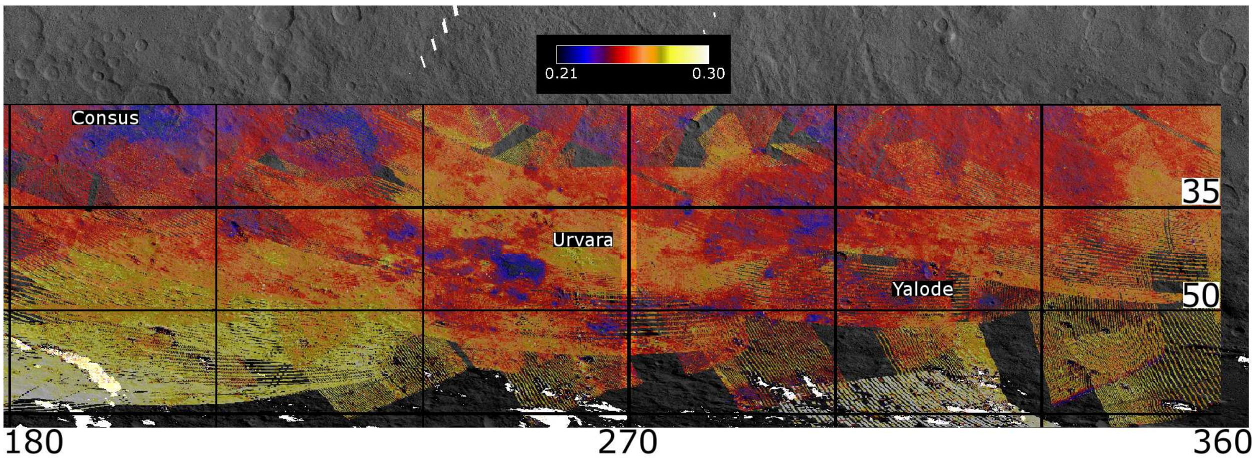

Fig. 2 Intensity of the 2.72 µm band superimposed to the clear filter mosaic

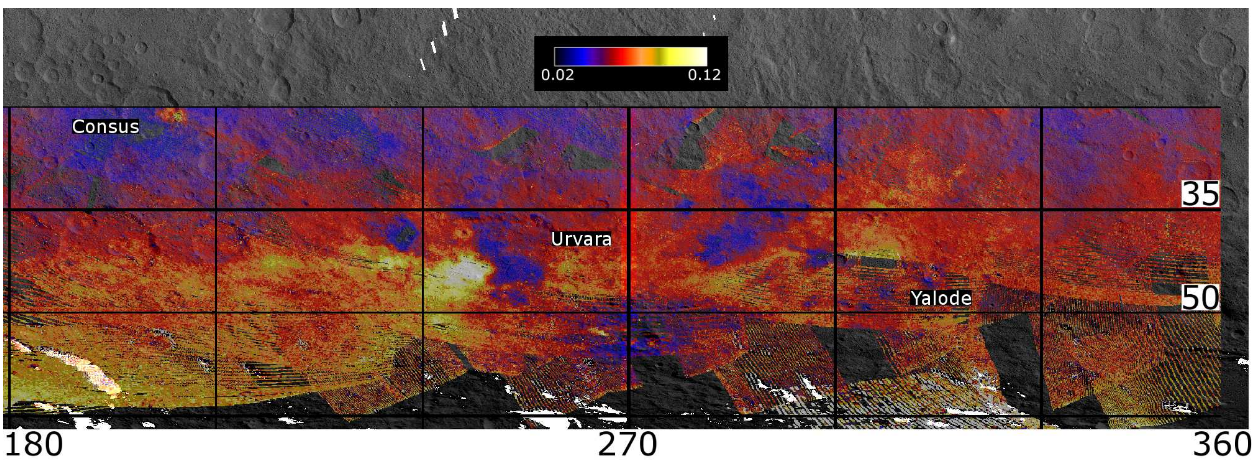

Fig. 3 Intensity of the 3.06 µm band superimposed to the clear filter mosaic