FACULAE ON CERES: IMPLICATIONS FOR POTENTIAL FLUIDS IN THE SUBSURFACE O. Ruesch[1], A. Nathues[2], R. Jaumann[3], L. C. Quick[4], J. C. Castillo-Rogez[5], M. T. Bland[6], T. J. Bowling[7], S. Byrne[8], , H. Hiesinger[9], K. Krohn[3], L. A. McFadden[10], A. Neesemann[11], K. Otto[3], P. Schenk[12], J. Scully[5], M. V. Sykes[4], D. A. Williams[12], C. A. Raymond[5], C. T. Russell[13], [1]NASA Goddard Space Flight Center/USRA, Greenbelt, MD, USA. (ottaviano.ruesch@nasa.gov), [2]Max Planck Institute for Solar System Research, Goettingen, Germany, [3]DLR, Berlin, Germany, [4]PSI, Tucson, AZ, USA, [5]JPL, Caltech, Pasadena, CA, USA, [6]USGS, Flagstaff, AZ, USA, [7]University of Chicago, Chicago, IL, USA, [8]LPL, U. of Arizona, Tucson, AZ, USA, [9]Institut fuer Planetologie, Westfaelische Wilhelms Universitaet Muenster, Muenster, Germany, [10]NASA Goddard Space Flight Center, Greenbelt, MD, USA, [11]Institute of Geoscience, FU Berlin, Berlin, Germany, [12]LPSI, Houston, TX, USA, [12]School of Earth & Space Exploration, ASU, Tempe, AZ, USA, [13]Earth, Planetary and Space Sciences, U. of California, Los Angeles, CA, USA.

Introduction: The NASA Dawn mission has provided geological evidence for a recent cryovolcanic dome (Ahuna Mons) on the surface of dwarf planet Ceres [1]. The dome formation probably required the presence of fluids in a subsurface reservoir as well as during extrusion [1, 2]. Dawn near-IR spectral observations identified sodium carbonate at the cryovolcanic dome [3], possibly formed by crystallization of the salt-rich fluids (i.e., brine). The most extensive sodium carbonate deposits on Ceres have been detected within Occator crater, in bright spots referred to as Cerealia and Vinalia faculae [4] (Fig. 1). Such deposits have also been interpreted as solid residue of a crystallized brine [4-6]. In order to better understand the formation of the faculae, we use Dawn clear-filter framing camera (FC) images (~35 m/pixel) to perform morphological analyses. We will discuss whether the faculae are potentially linked to a subsurface liquid reservoir, as suggested for the cryovolcanic Ahuna Mons.

Observations: The morphology of Vinalia faculae (site 1 and 2, Fig. 2) is characterized by a central, circular to irregular depression, surrounded by a discontinuous bright mantling. Cerealia facula (site 3, Fig. 2) is dominated by a domical feature dissected by troughs and pits. At the three sites, the boundary between the main bright area and the surrounding darker terrain is complex, with small ~200 m- patches of bright material found outside the facula.

Discussion: We considered various formation mechanisms to explain the entire range of morphologies of Fig. 2, i.e., impact cratering, sublimation, decompression of gas-rich ice and evaporation and freezing of liquid water in vacuum (i.e., cryovolcanism). The latter two processes appear as the most probable, and confirm the role of water (potentially liquid) during Ceres recent past. Compared to the global-scale geologic and cryovolcanic activity of the "ocean worlds", e.g., Europa, the regional distribution of potential cryovolcanic features on Ceres suggests an activity linked to regional-scale subsurface reservoirs.

References: [1] Ruesch et al. (2016) *Science*, 353, 6306, aaf4285. [2] Neveu and Desch, (2015) *GRL*, doi:10.1002/ 2015GL066375. [3] Zambon et al. (2016) *GRL*, doi :10.1002/ 2016GL071303. [4] De Sanctis et al. (2016) *Nature* 536, 54-57. [5] Nathues et al. (2015) *Nature*, 528, doi :10.1038/nature15754. [6] Nathues et al. (2016) *PSS*, doi :10.1016/ j.pss.2016.10.017.

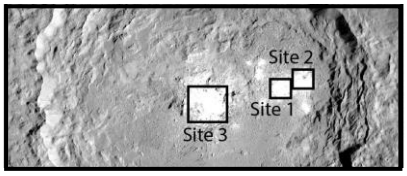

Figure 1*. Section of the 92-km large Occator crater on Ceres (20°N-240ºE) with location of sites shown in Fig. 2.*

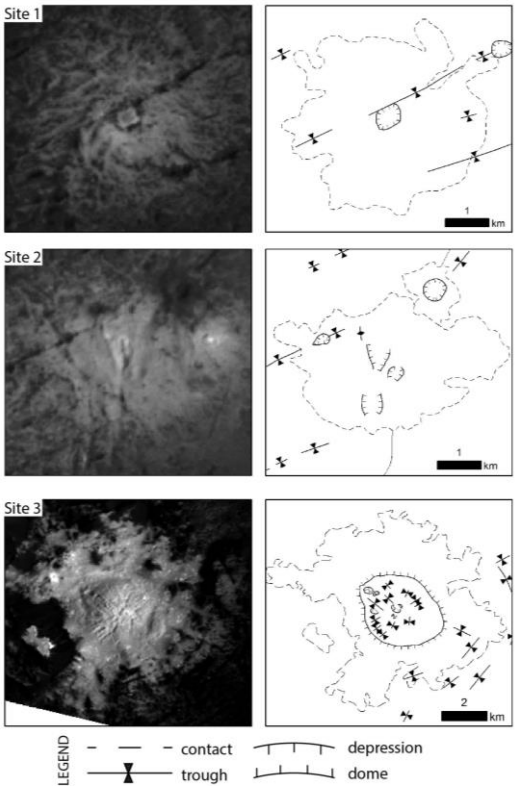

Figure 2*. FC LAMO images of bright spots (left) with associated structural and morphological sketches (right) found within Occator crater. Site 1 and site 2 form the Vinalia faculae. Site 3 is Cerealia facula.*