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ORIGIN AND EVOLUTION OF DWARF PLANET CERES FROM DAWN

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Prior to Dawn's arrival, Ceres was already known from ground- and space-based observations to be a dark, wet dwarf planet with evidence for altered minerals and water vapor emissions. Dawn found a very dark, cratered surface punctuated by small extremely bright areas. Contrary to the expectation of an ice-rich, viscously-relaxed smooth surface resulting from physical differentiation and freezing of an ancient subsurface ocean, its surface has many craters, implying a mechanically strong thick crust. Ceres is, however, missing the largest expected craters and is gravitationally relaxed at lowest orders, implying that the strong crust overlies a weaker deep interior. Dark material, phyllosilicates, ammoniated clays, and carbonates dominate Ceres' surface. The ubiquitous presence of ammoniated minerals suggests formation in a cold environment, pointing to an outer solar system origin. The distribution of minerals indicates that Ceres' interior experienced pervasive alteration. Moreover, certain processes that are not yet fully understood resulted in material formed at depth being brought to the surface. Water ice has also been observed in fresh craters at high latitudes, and elemental measurements indicate the presence of water ice in the immediate subsurface. The topography and morphology of the surface reveal regional variations, with smoother, apparently resurfaced areas that are generally at lower elevation and rougher areas with greater relief. Local morphology such as crater floors deposits, isolated mountains, and the enigmatic bright areas indicate active processes on Ceres that likely involves brine-driven cryovolcanism.

Session No. 211

P3. Exploring the Third Zone: The Geology of Pluto, Charon, and the Kuiper Belt
Tuesday, 27 September 2016: 1:30 PM-5:30 PM

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