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Editorial

Surface composition of dwarf planet Ceres: Constraints from the Dawn spacecraft mission

Ceres' surface composition is the primary and most visible direct evidence of its interior chemical evolution from primary accretion to present day condition, and thus the subject is treated separately in this special issue. The global composition was observed first by ground-based telescopes with hemispherical resolution. The Dawn mission has now identified and mapped from orbit Ceres' specific minerals and elements to resolutions that allow comparison with geological features that are associated with internal and external physical and chemical processes. Throughout this long history of compositional analysis, the evidence has grown that Ceres' evolution has been controlled by a high water content that moderated radio-isotope heating and dominated the rock chemistry. More and more specific aqueously altered minerals have been identified as observational techniques and platforms have improved, from generally aqueously altered minerals "like clays" to the current Dawn reports of Mg- and NH_4-phyllosilicates. These are overlain by or mixed in some locations with carbonate and sodium salts, often associated with geologically very young cryovolcanic-like geological features, apparently intruded from below. Organic–rich material is detected in a few places, whose origin is still uncertain. Mapping of these constituents indicates that the water-driven evolution has been global in nature and may continue today. Yet, local compositional differences and little correlation of global geological and compositional units suggest that the interior of Ceres isn't spherically uniform and that vertical displacements mix deeper material to the surface in places, perhaps with current activity.

First results from Dawn at Ceres were published in *Science* (vols. 353 and 355) and *Nature* (vols. 528, 535, 536, and 537). Geologic maps and a timescale for Ceres are being published in *Icarus* (Williams et al., 2017), as well as an assessment of the interior evolution in MAPS. Other special issues of science journals are under development that treat special topics, but these earlier publications, including this current issue, present a global picture of our knowledge of Ceres after Dawn.

This special issue describes the current knowledge of the global surface composition of Ceres made by the Dawn mission. McCord and Zambon (2019) provide the historical context for our knowledge of Ceres' evolution and resulting surface mineralogy and an overview of Dawn's major results concerning this subject. Frigeri et al. (2019) describes the parameters and techniques used to develop the compositional maps. Several articles treat global topics that place the surface composition maps in better context: Combe et al. (2019a) describes the water deposits, Prettyman et al. (2019) treats the global elemental composition, Stephan et al. (2019a) explore the geology context, and Galiano et al. (2019) interpret what the uplifted crater central peak materials tell us about the subsurface composition. The remaining 11 articles (Carrozzo et al., 2019; Combe et al., 2019b; De Sanctis et al., 2019; Longobardo et al. 2019a, 2019b; Palomba et al., 2019; Raponi et al., 2019; Singh et al., 2019; Stephan et al. 2019b; Tosi et al., 2019; Zambon et al., 2019) describe the surface mineralogy for each of the geological quadrangles. The mineralogy surface maps are presented by mapping quadrangle so as to coordinate with the treatment of the surface geology and morphology in the separate Icarus special issue. There are insufficient data to treat two of the quadrangles.

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