# P23D-01: Ceres Evolution: From Thermodynamic Modeling and Now Dawn Observation

ABSTRACT

**Tuesday, 15 December 2015**
**13:40 - 13:55**
*Moscone West - 2009*

Thermodynamic modeling indicated that Ceres has experienced planetary processes, including extensive melting of its ~25% water and differentiation, (McCord and Sotin, JGR, 2005; Castillo and McCord, Icarus, 2009). Early telescopic studies showed Ceres' surface to be spectrally similar to carboneous-chondrite-like material, i.e., aqueously altered silicates darkened by carbon, with a water-OH-related absorption near 3.06 µm. Later observations improved the spectra and suggested more specific interpretations: Structural water in clay minerals, phyllosilicates, perhaps ammoniated, iron-rich clays, carbonates, brucite, all implying extensive aqueous alteration, perhaps in the presence of $CO_2$. Telescopic observations and thermodynamic models predicted Dawn would find a very different body compared to Vesta (e.g. McCord et al., SSR, 2011), as current Dawn observations are confirming. Ceres' original water ice should have melted early in its evolution, with the resulting differentiation and mineralization strongly affecting Ceres' composition, size and shape over time. The ocean should have become very salty and perhaps may still be liquid in places. The surface composition from telescopes seems to reflect this complex history. The mineralization with repeated mixing of the crust with the early liquid interior and with in-fall from space would create a complex surface that will present an interpretation challenge for Dawn. The Dawn spacecraft is currently collecting observations of Ceres' landforms, elemental and mineralogical/molecular composition and gravity field from orbit. Early results suggest a heavily cratered but distorted and lumpy body with features and composition consistent with internal activity, perhaps recent or current, associated with water and perhaps other volatiles. We will present and interpret the latest Dawn Ceres findings and how they affect our earlier understanding of Ceres evolution from modeling and telescope observations.

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Thomas McCord
*Bear Fight Institute*

Jean Philippe Combe
*Bear Fight Institute*

Julie Castillo
*NASA Jet Propulsion Laboratory*

Carol Raymond
*NASA Jet Propulsion Laboratory*

Maria Cristina De Sanctis
*IAPS-INAF*

Ralf Jaumann
*German Aerospace Center DLR Berlin*

Eleonora Ammannito
*University of California Los Angeles*

Christopher Russell
*University of California Los Angeles*

Scientific Team: The Dawn Mission Science Team

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