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DAWN ARRIVES AT CERES: RESULTS OF THE SURVEY ORBIT

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Abstract

In September 2012 the Dawn spacecraft left Vesta the second most massive body in the asteroid main belt and set sail for Ceres the most massive. On March 6, 2015 Dawn settled into orbit around Ceres becoming the first spacecraft to orbit separately two distant solar orbiting bodies and establishing a new era in space exploration. Unlike Vesta, Ceres has remained hidden from our geochemical eyes into the origin of the asteroid belt, the analysis of meteorites. Ceres has no known associated meteorites nor a family of asteroids. The observations at Ceres return totally new information. Dawn is equipped with a framing camera with one clear and seven color filters, a visible and infrared mapping spectrometer, a gamma ray and neutron spectrometer and radiometric tracking for gravity determination.

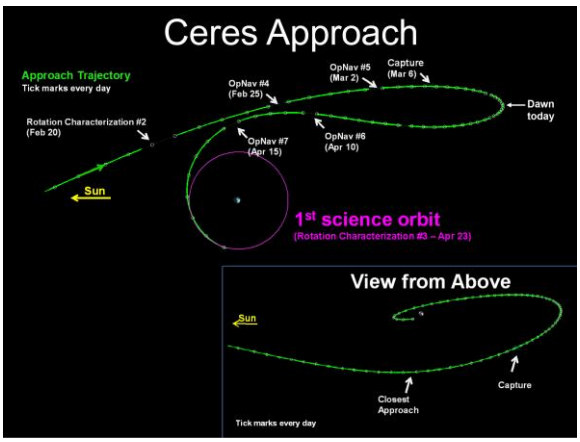

Figure 1: The trajectory that puts Dawn into the RC3 polar orbit. Top: side view. Bottom: view from above.

The approach trajectory is shown in Figure 1. A distant pass over the daylight surface was followed by a distant looping orbit over the dark side. Then in late April Dawn settled into a high altitude orbit known as Rotational Characterization (RC3). On the approach to RC3 the spacecraft found a pair of bright spots on the surface at about 240ºE longitude and 20ºN latitude shown in Figure 2. These two spots were not resolved at the distances flown during approach.

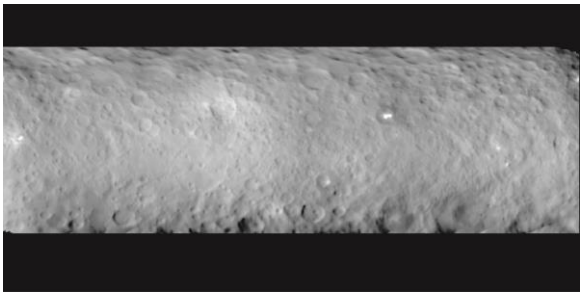

Figure 2: Mosaic of Ceres surface obtained on rotational characterization 2 showing cratered surface and two very bright neighboring spots near 240ºE longitude and 20ºN

The observation campaign in RC3 is illustrated in Figure 3. The orbit is a circular polar orbit. It

crosses the dayside and the nightside. The orbit is ideal for obtaining high phase angle scattering from any plume material emanating from the surface. It also maps the lit surface at 20 times the Hubble resolution. This orbit also provides precise data on the mass, volume and spin axis of Ceres.

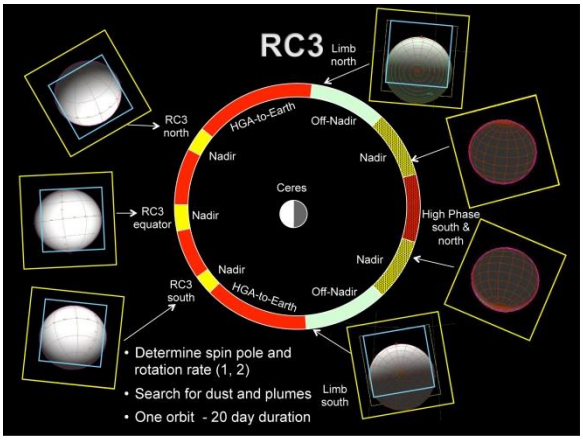

Figure 3: View of Ceres to be seen in the polar RC3 orbit.

In early June the spacecraft enters Survey orbit, optimized for the VIR mapping spectrometer. Figure 4 shows seven of the eight mapping cycles covering

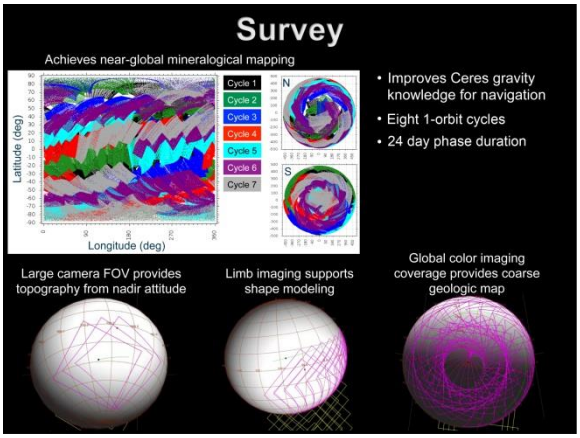

Figure 4: Mapping strategy for camera in the survey orbit.

Ceres during the ensuing three weeks. This provides a comprehensive map of the composition of Ceres' surface. This orbit provides topography shape modeling and global color maps in addition. After this mapping is complete the spacecraft descends to the High Altitude Mapping Orbit (HAMO). This orbit will not be complete by the time of the EPSC meeting.

Summary and Conclusions

Dawn has reached Ceres with sufficient resources to accomplish all its objectives. Ceres has already proven to be a most interesting body, possibly unique in the solar system.

Acknowledgements

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