

SPACE EXPLORATION SYMPOSIUM (A3)
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DAWN AT CERES: THE FIRST EXPLORATION OF THE FIRST DWARF PLANET

Abstract

Dawn has exceeded the objectives of its primary mission of orbiting and exploring protoplanet Vesta and dwarf planet Ceres, the two most massive objects in the main asteroid belt. Since arriving at Ceres in March 2015, the spacecraft has acquired all the planned data from four circular polar orbits ranging in altitude from 13,600 km to 385 km. Dawn has provided a uniquely detailed view of the first dwarf planet discovered. With a mean diameter of 940 kilometers, Ceres contains about 30% of the mass in the entire main asteroid belt. It displays extensive evidence of active geological processes, including many areas of high albedo that may be salts left behind when water sublimated. The overall strategy for exploring Ceres was based strongly on the extremely successful 16 months of Vesta operations. Nevertheless, the loss of two of the spacecraft's four reaction wheels necessitated some important changes. These changes were so effective that Dawn has been able to operate beyond the expected end of life, acquiring significantly more data than planned. This paper will describe the completion of Dawn's interplanetary cruise from Vesta to Ceres, its unique orbit insertion at Ceres (different even from Vesta orbit insertion), Ceres operations, and the major findings there. We also will present prospects for a brief extended mission, with the lifetime limited by the expenditure of hydrazine in the absence of a full complement of reaction wheels.