TSF16-2016-000007

Abstract for an Invited Paper
for the TSF16 Meeting of
the American Physical Society

New Horizons explores the Pluto system

JOHN SPENCER, Southwest Research Institute

During its July 2015 flyby of Pluto and its five moons, the New Horizons mission obtained a wealth of data that has revolutionized our understanding of the Pluto system. Much of Pluto's outer shell of water ice is ancient and rigid, but much of the surface has been reworked, up to the present day, by a bewildering variety of geological processes. One hemisphere of Pluto is dominated by a feature unique (to our knowledge) in the solar system: a 1000 km wide field of actively convecting nitrogen and other ices occupying a large depression. Plutos surface color and composition is very varied, and is dominated by dark red tholins and N_2, CH_4, and CO ices, with H_2O ice bedrock also exposed in many places. Plutos hazy atmosphere, dominated by N_2 with a current surface pressure of 10 microbars, is supported by sublimation of the surface ices, and is much more tightly bound to the planet than expected before the flyby.¡p¿ Plutos giant moon Charon shows pervasive extensional tectonism and locally extensive cryovolcanic resurfacing, both dating from early in solar system history. Its color and surface composition, dominated by H_2O ice plus NH_3 hydrate, is remarkably uniform apart from a thin deposit of dark red material near the north pole which may be due to cold-trapping and radiolysis of hydrocarbons escaping from Pluto. Plutos four small moons, probably created from the debris of the giant collision that also formed Charon, exhibit complex rotational behavior unlike any seen elsewhere in the solar system.¡p¿ Unlike many icy satellites of the giant planets, neither Pluto nor Charon is likely to have experienced tidal heating during the period when observable landforms were created. Both objects therefore provide an important testbed for models of internal heating of icy worlds throughout the outer solar system.