NES16-2016-000032

Abstract for an Invited Paper
for the NES16 Meeting of
the American Physical Society

**Tidal heat and fluid flow on Pluto**

GEOFF COLLINS, Wheaton College

The flyby of Pluto and Charon by the New Horizons spacecraft in July 2015 revealed amazingly active worlds on the frigid edge of our solar system. Plutos surface includes ancient deformed terrains as well as young surfaces with possible glacial activity and surface convection driven by heat escaping from the interior. Part of the explanation for the activity on Pluto may trace to exotic ices like nitrogen which are soft and potentially mobile at Plutos surface temperature. But the bulk of the ancient crust is water ice, which should be very stiff at these temperatures, so what is driving the ancient activity? We have created an energy-balance model of Plutos interior after the Charon-forming impact, including tidal heating as Charons orbit evolves to its present state, and including parameterized convection models of the behavior of Plutos ice shell. We find a strong thermal feedback process early in Plutos history that would have led to rapid evolution of Charons orbit and a significant heat pulse within Pluto. This heat pulse could drive the ancient tectonic activity on Pluto and create a deep ocean in its interior.