

CONTROL ID: 2817754

TITLE: Pluto: Fluidized transport of tholins by heating of the subsurface

ABSTRACT BODY:

Abstract (2,250 Maximum Characters): New Horizons images of Pluto show evidence of the transport of the colored non-ice component across the surface, with substantial accumulations in some areas of low elevation. The non-ice component is presumed to be tholin produced in the atmosphere as a precipitating aerosol, in the surface ices by photolysis or radiolysis, or both. We model the surface layer of N₂ ice with varying amounts of incorporated tholin particles to explore the heating within the ice that occurs by the solid-state greenhouse effect. We find that in plausible models of the contaminated N₂ surface ice the triple point temperature (63.15K) is reached at a depth of ~< 1m. At that depth the confining pressure of the ice column is much less than the triple point pressure (12.52 kPa), so N₂ should convert to the gas phase, exerting pressure on the overburden. When the gas pressure exceeds the strength of the confining ice, a breakout on the surface will occur, fluidizing fragments of ice and its contaminants that are then free to flow downhill, rafted on entrained gas, similar in some ways to the pyroclastic volcanic phenomenon known as nuée ardente. The digital elevation map of Pluto made from stereo images shows some surface regions that may have been stripped of the N₂ layer, exposing H₂O ice (presumed to be bedrock) below, with a corresponding accumulation of dark material that was that was the previously entrained particulate tholin. Accumulations of tholin are found associated with some of the fossae, and some cover preexisting topography to depths of up to a few hundred meters. Supported by the New Horizons project.

CURRENT CATEGORY: Pluto System

CURRENT : None

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