EPSC Abstracts,
Vol. 2, EPSC2007-A-00283, 2007
European Planetary Science Congress 2007

Volatile Loss and Retention on Kuiper Belt Objects

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Recent discoveries have shown that three of the largest Kuiper Belt objects - Eris, 2005 FY9, and Sedna - are coated in methane and may contain other volatile ices as well. New detailed observations show that even within this class of volatile-rich bodies, unexpected differences exist in their surface compositions. 2005 FY9, a body approximately 60% the size of Pluto, with a reflectance spectrum similarly dominated by methane, has a surface depleted in molecular nitrogen by at least an order of magnitude with respect to Pluto.

To understand volatile loss and retention on KBOs, we have constructed a simple model of atmospheric escape that allows us to predict which bodies should be capable of retaining which surface volatile ices to the present day. While it has long been expected that large and cold bodies in the outer solar system should have the potential of retaining their volatile ices, the recent proliferation of new discoveries in the Kuiper Belt provides us with a range of bodies with varying sizes and orbits on which to test predictions of volatile loss and retention. We present new high-resolution infrared spectra of Eris, 2005 FY9 and Quaoar and provide new constraints on the presence of volatile ices on the surfaces of these bodies.