Geophysical Research Letters

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Manuscript #	2012GL051395
Current Revision #	0
Submission Date	2012-02-17 16:32:52
Current Stage	Under Review
Title	Wind-Induced Atmospheric Escape: Titan
Running Title	Wind-Induced Atmospheric Escape: Titan
Manuscript Type	Regular Article
Special Section	N/A
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Abstract	Rapid thermospheric flows can significantly enhance the estimates of the atmospheric loss rate and the structure of the atmospheric corona of a planetary body. In particular, rapid horizontal flow at the exobase can increase the corresponding constituent escape rate. Here we show that such corrections, for both thermal and non-thermal escape, cannot be ignored when calculating the escape of methane from Titan, for which drastically different rates have been proposed. Such enhancements are also relevant to Pluto and exoplanets.
Associate Editor	Assigned
Keyword(s)	escape, wind, Titan
Index Terms	5210, 5704, 5744, 5780, 6035
Subset	PLANETS (PLA)
Does your submission have auxiliary material?	No
Question 1. *Major Topic or Scientific Question	How does a horizontal wind at the exobase affect the escape rates of major constituents on Titan?
Question 2. *New	Horizontal winds at the exobase significantly enhance the escape rate of

Scientific Knowledge	methane.
Question 3. *Broad Implications	This escape enhancement caused by horizontal winds occurs on many other bodies such as Pluto.
Related Manuscript	N/A
Key Points	Please state the three main points of the article. Main point #1: (80 character limit) A horizontal wind at the exobase of Titan increases its escape rates. Main point #2: (80 character limit) The escape enhancement caused by horizontal winds occurs on other bodies. Main point #3: (80 character limit) Continually improved thermosphere models yield improved exobase level winds.
Electronic Forms	1 of 1 forms complete - View Electronic Forms Status

Manuscript Items

1. Merged File containing manuscript text and 3 Figure files. PDF (558KB)
   a. Article File PDF (149KB)
   b. Figure 1a PDF (60KB)
   Ratio of wind-enhanced escape flux, F, divided by the Jeans escape flux, FJ, versus the horizontal wind speed, U, at 142 K, where (a) is for methane, CH4, and (b) is for molecular nitrogen, N_2.
   c. Figure 1b PDF (61KB)
   Ratio of wind-enhanced escape flux, F, divided by the Jeans escape flux, FJ, versus the horizontal wind speed, U, at 142 K, where (a) is for methane, CH4, and (b) is for molecular nitrogen, N_2.
   d. Figure 2 PDF (289KB)
   Density profiles of exospheric N_2 and CH_4 are shown. Exospheric densities, n, normalized by their exobase values, n_0, versus the radial distance, r, normalized by the exobase radius, R_{exo}.

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