



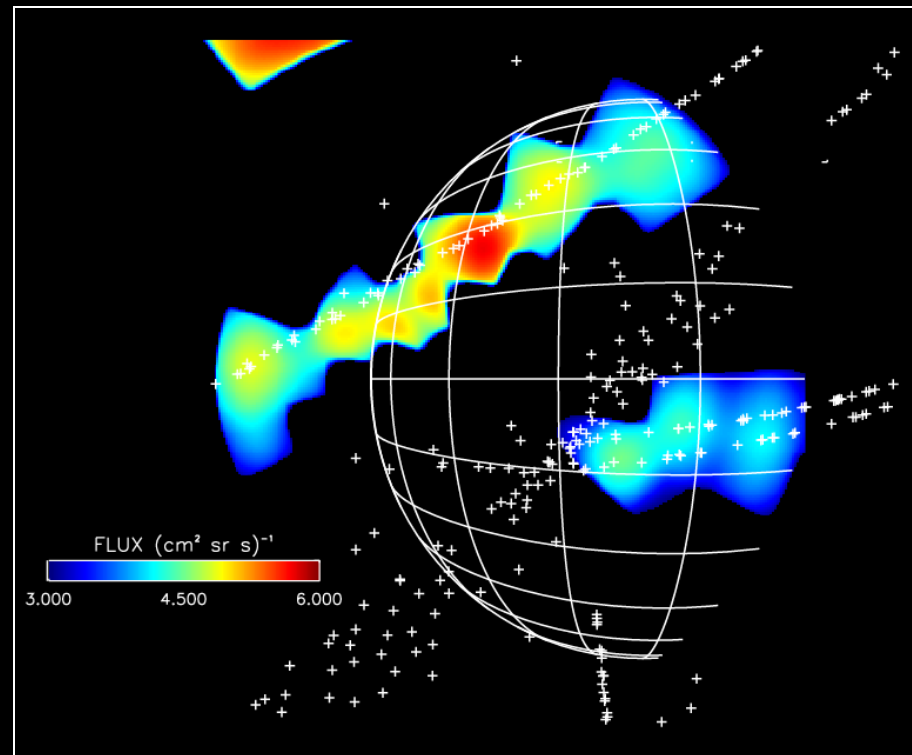
# VEX / ASPERA-4

APL  
The Johns Hopkins University  
APPLIED PHYSICS LABORATORY



## Solar Wind Interaction and Atmospheric Escape

+ *Bonus Measurement*



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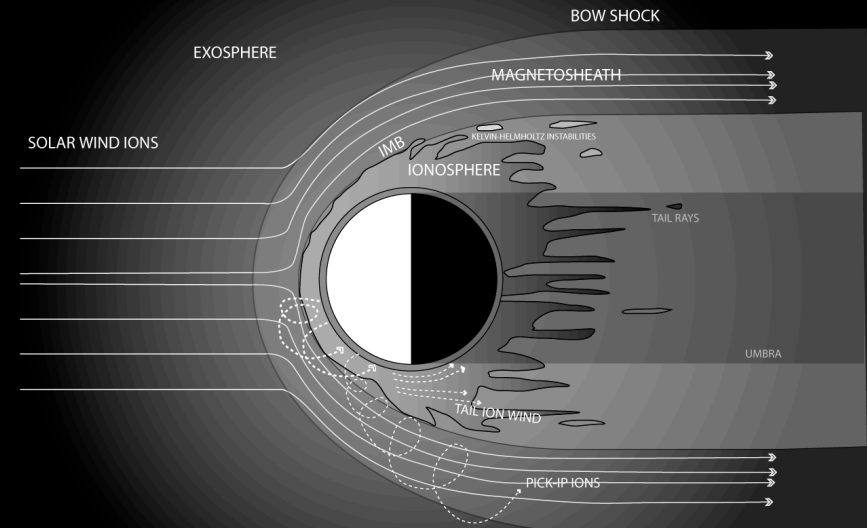
*Other VEX solar-wind interaction scientists: J. G. Luhmann and C. T. Russell*



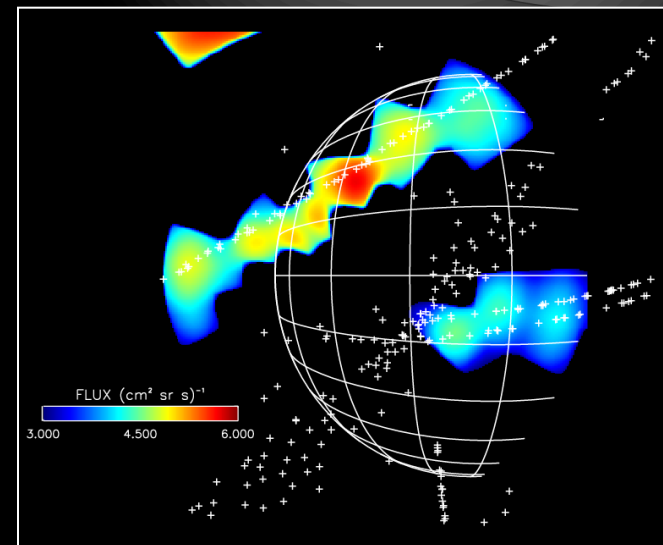
# Atmospheric Escape to Space

## RESULTS TO DATE

Source	Escape Rate (s <sup>-1</sup> )
Protons (O <sup>+</sup> detected, but not determined) <i>[Barabash et al., Nature, 2007]</i>	~10 <sup>25</sup> (~20 eV – 1 keV)
Neutral H (O not detected) <i>[Brandt et al., in preparation]</i>	~10 <sup>22</sup> (0.1 – 1.0 keV)

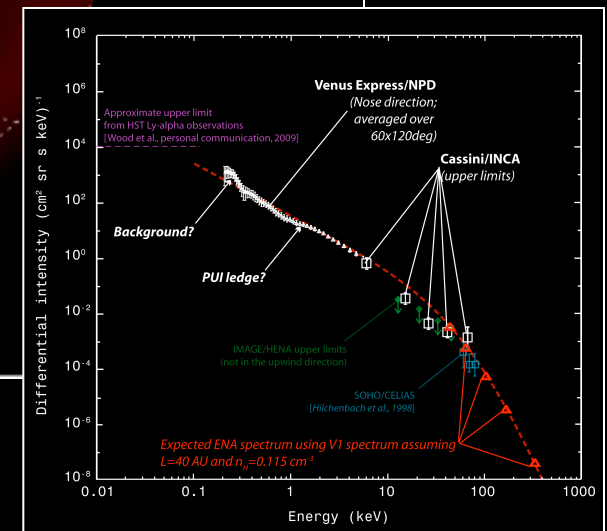
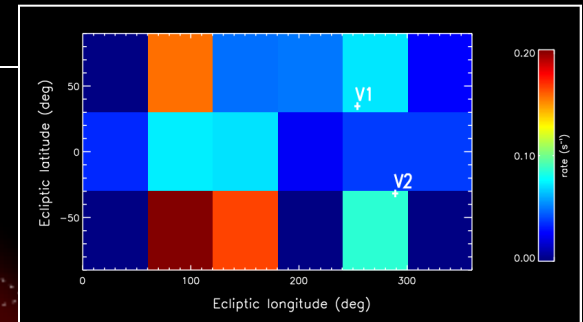
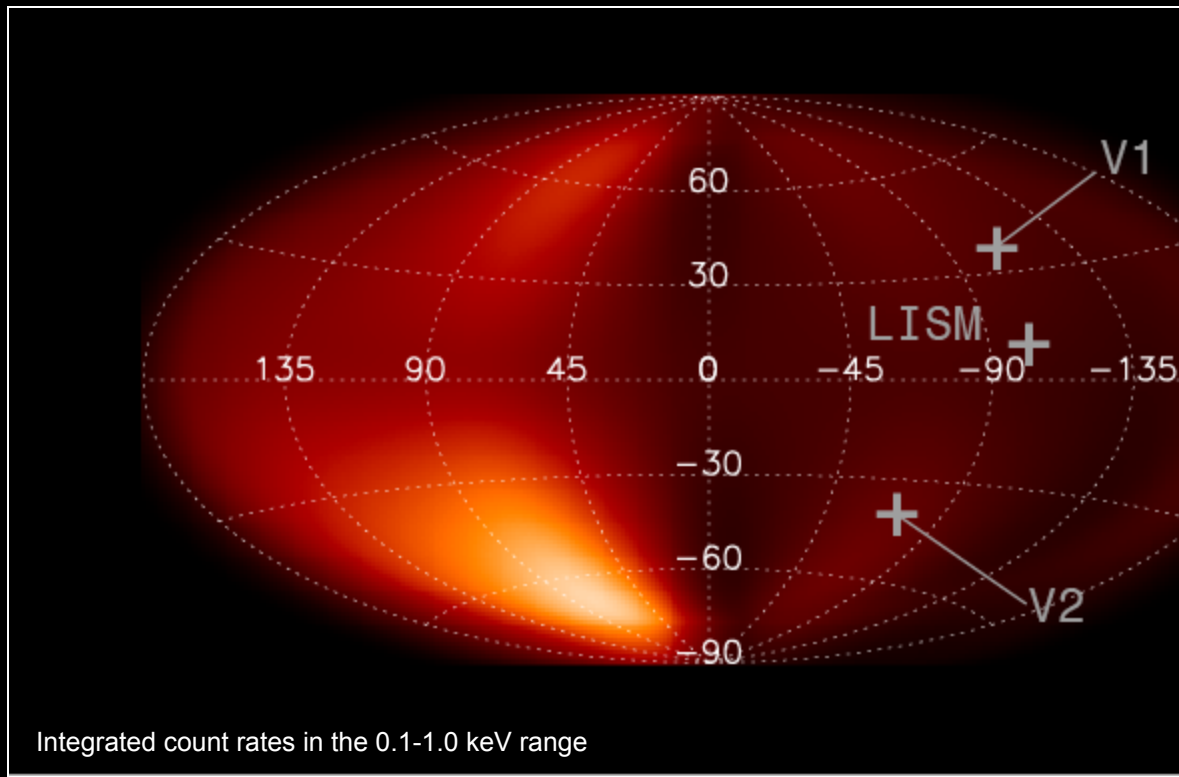


Years of measurements have been used to determine the average loss rate of atmospheric ions *[Barabash et al., 2007]* and neutrals *[Brandt et al.]*. The variability of the loss rates as a function of solar wind conditions is still under investigation *[Luhmann et al., 2008]*. The figure shows an “image” of remotely produced neutrals obtained from a few scans (crosses) of the Neutral Particle Detector (NPD) on ASPERA-4 from a fixed position behind Venus. The absence of neutrals from certain directions indicate strong spatial variability, possibly related to the solar wind magnetic field.



# Preliminary Image of the Heliospheric Boundary

## A BONUS RESULT



**First remote “image” of the heliosheath obtained by VEX/ASPERA-4/NPD by detecting fast neutrals (“ENAs”) [Brandt et al., in preparation, 2009]. The heliosphere is the magnetic bubble of the solar system, which plows through the local interstellar medium. The Voyagers recently crossed into the heliosheath. ENAs are so far the only way of remotely image the heliospheric boundary.**