

ASPERA-3 - Imaging plasma and energetic neutral atoms near Mars

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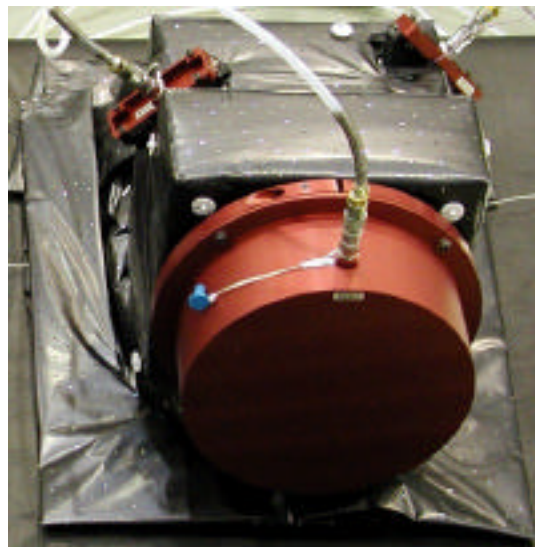
Swedish Inst. of Space Physics + 14 teams from Finland, France, Germany, Ireland, Russia, Switzerland, UK, and USA

Objective: To measure solar wind scavenging: The slow “invisible” escape of volatiles (atmosphere, hydrosphere) from Mars.

Question: Is the solar wind erosion the prime reason for the present lack of water on Mars?



Ion mass analyzer



Main Unit:

- Data processing
- Neutral particle imagers (NPI, NPD)
- Electron spectrometer (ELS)
- Mechanical scanner

Solar wind erosion of the Martian atmosphere

*Planetary wind = Outflow of atmosphere and ionosphere
(cometary interaction)*

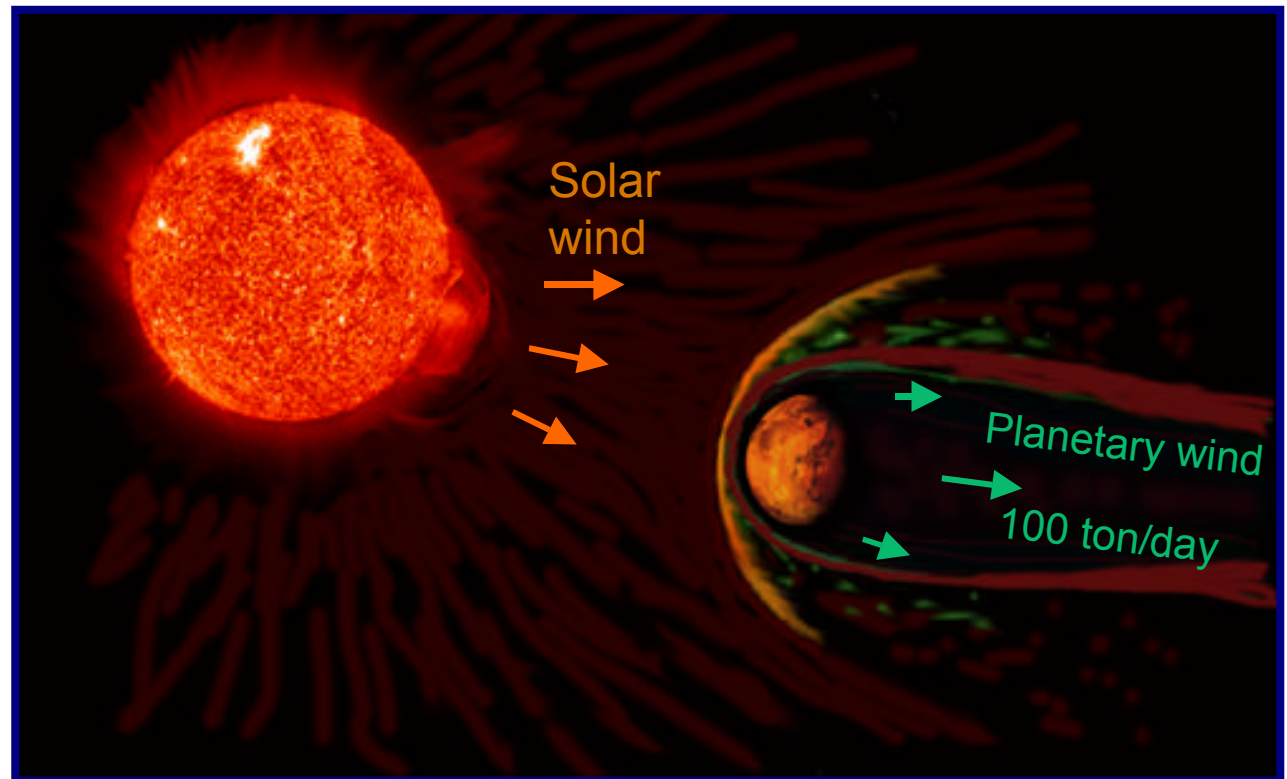
ASPERA will do global imaging and *in-situ* measurements of:

Inflow — solar wind

Outflow — planetary wind

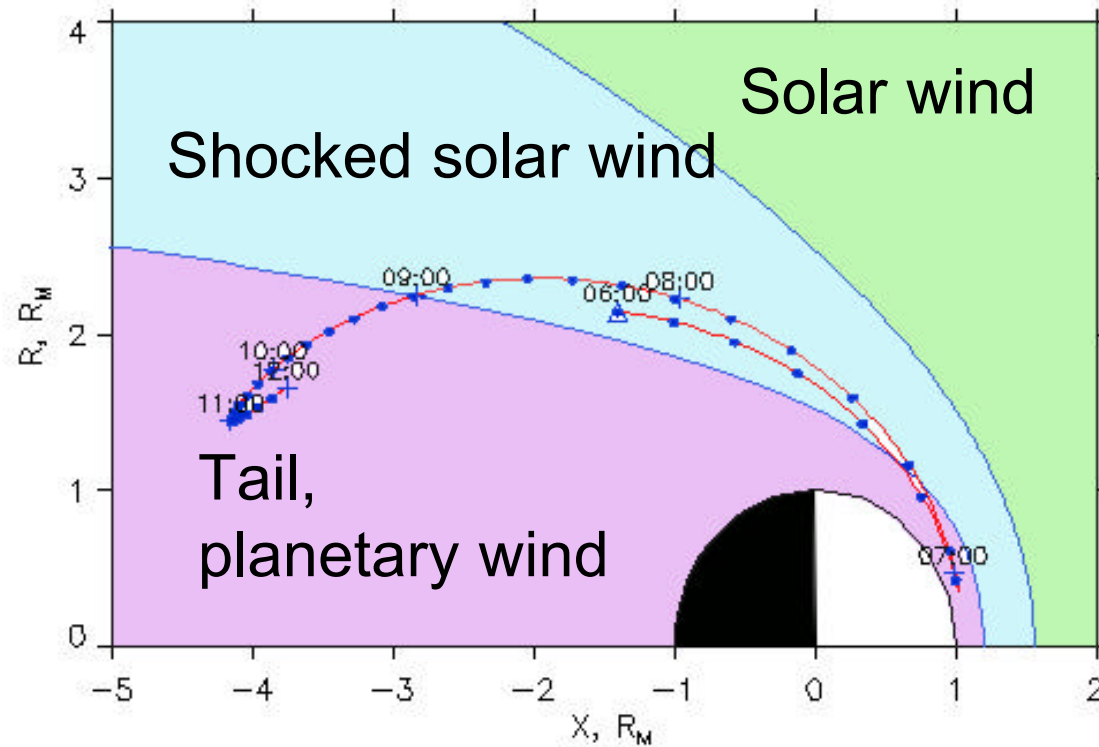
using:

Energetic neutral atom cameras and plasma (ion+electron) spectrometers

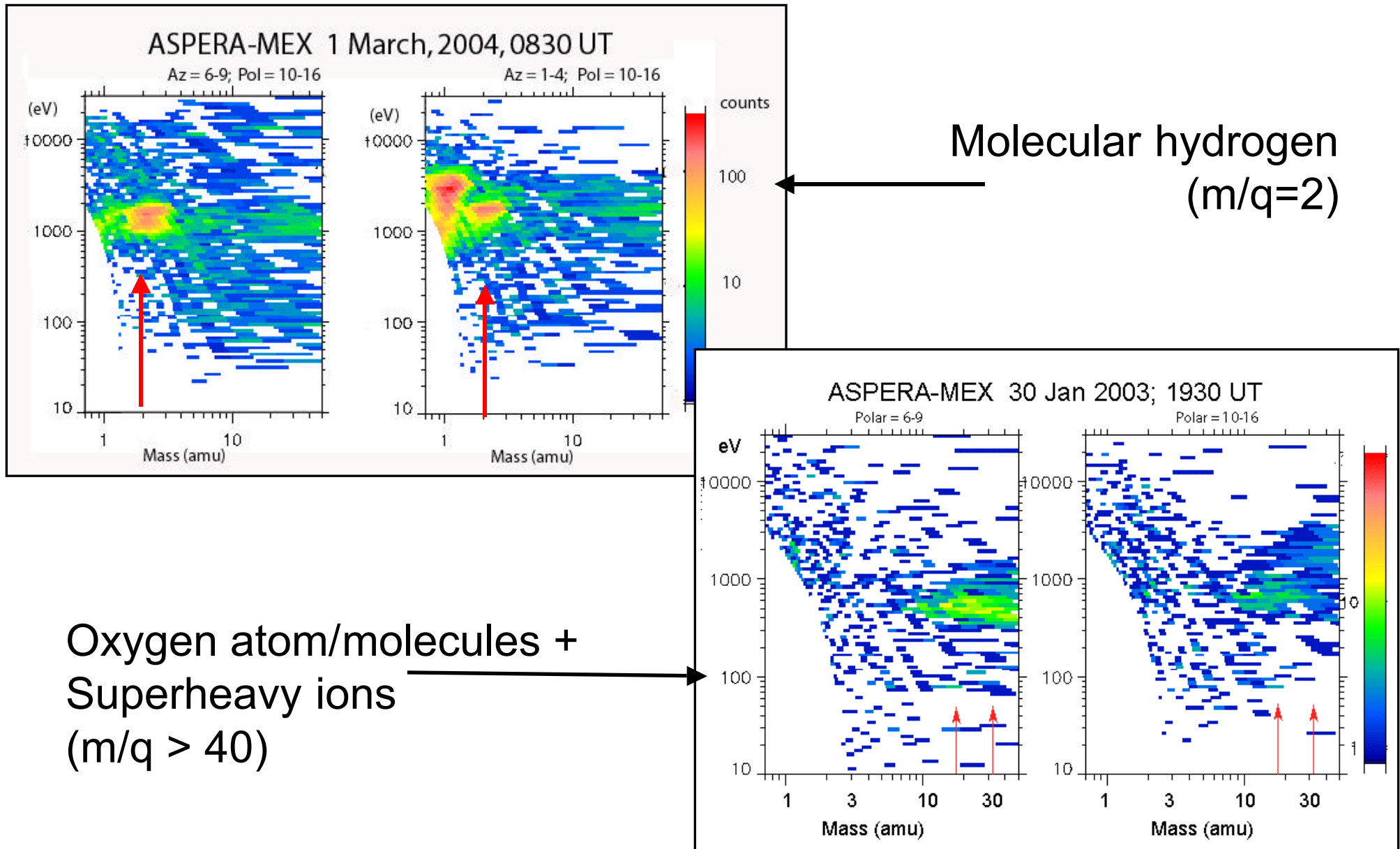


Note: Mars (and Venus) are planets lacking a strong intrinsic magnetic field (umbrella) => dehydration.

Mars Express tours the Martian plasma environment

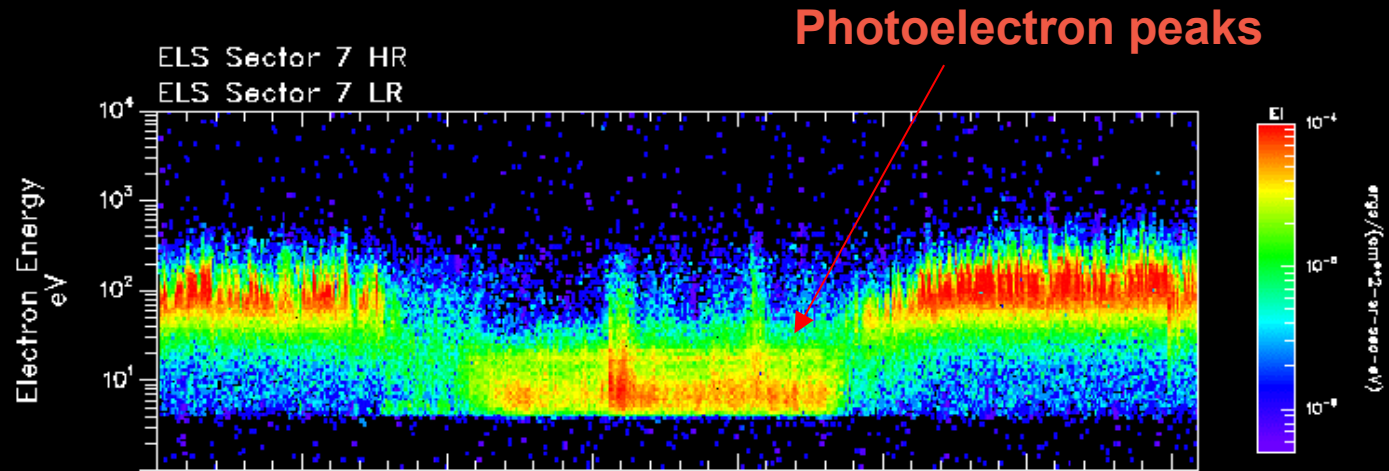


Planetary wind composition

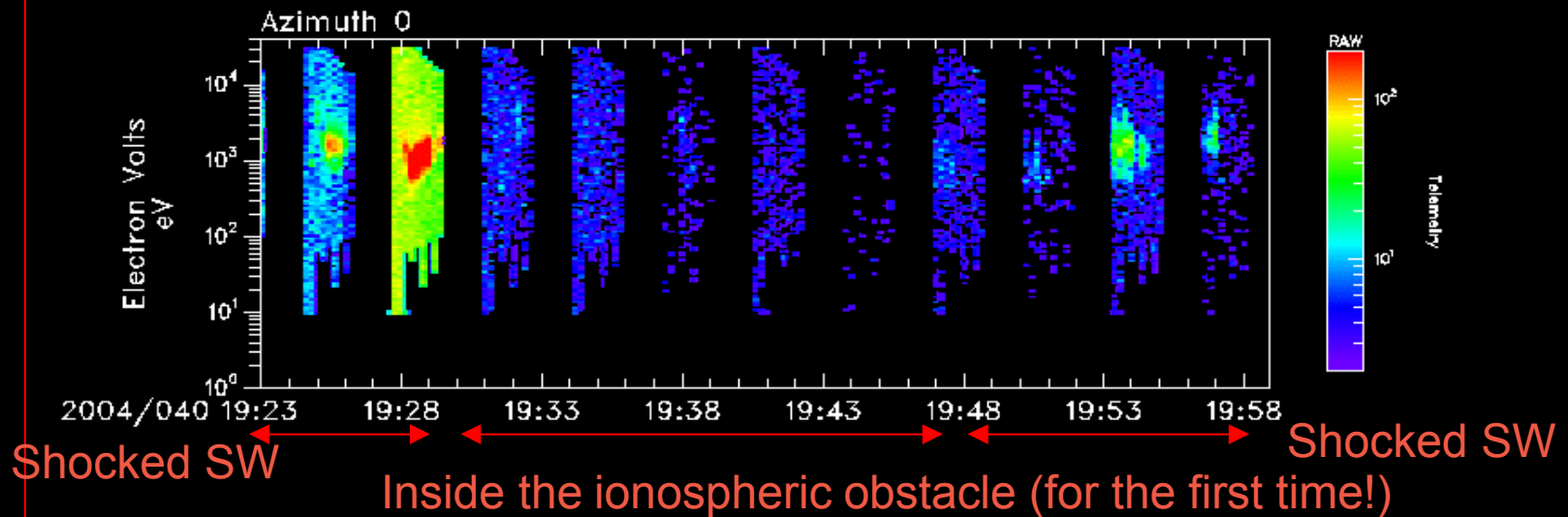


MEX encounters the ionosphere at Mars

Electrons

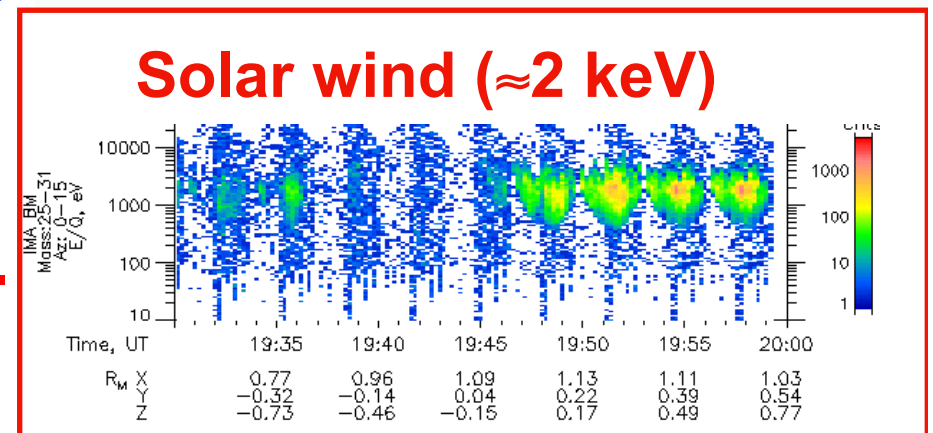
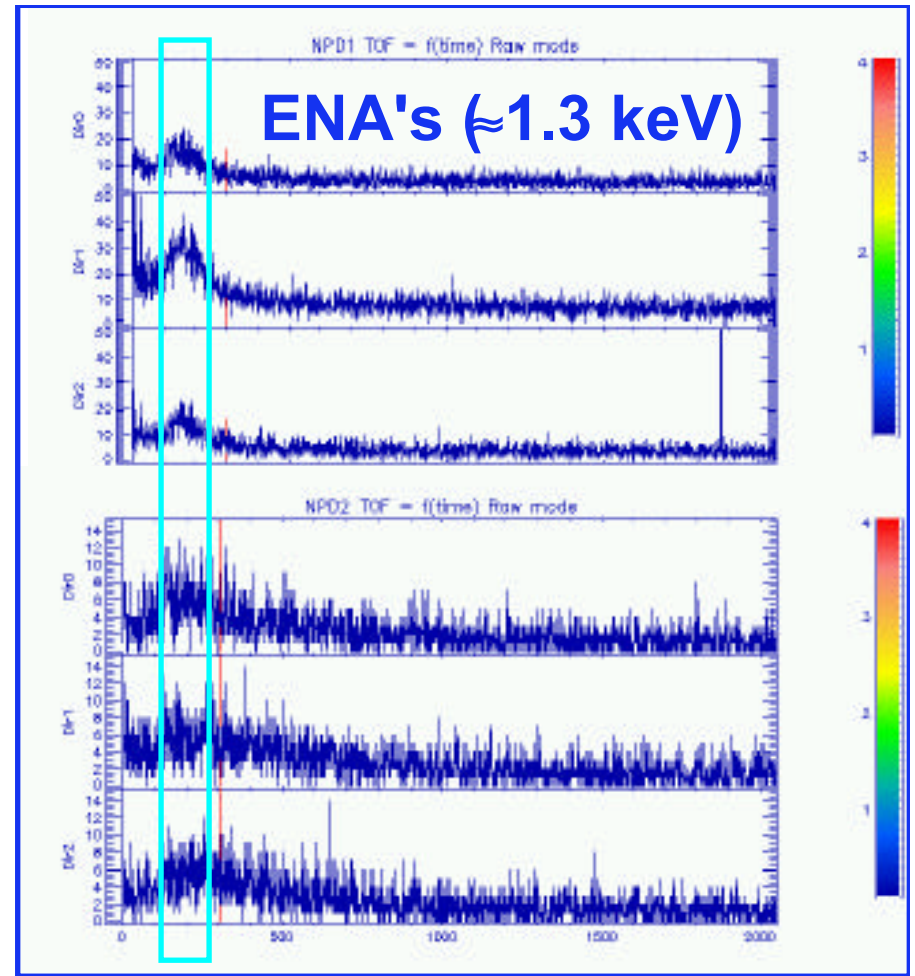
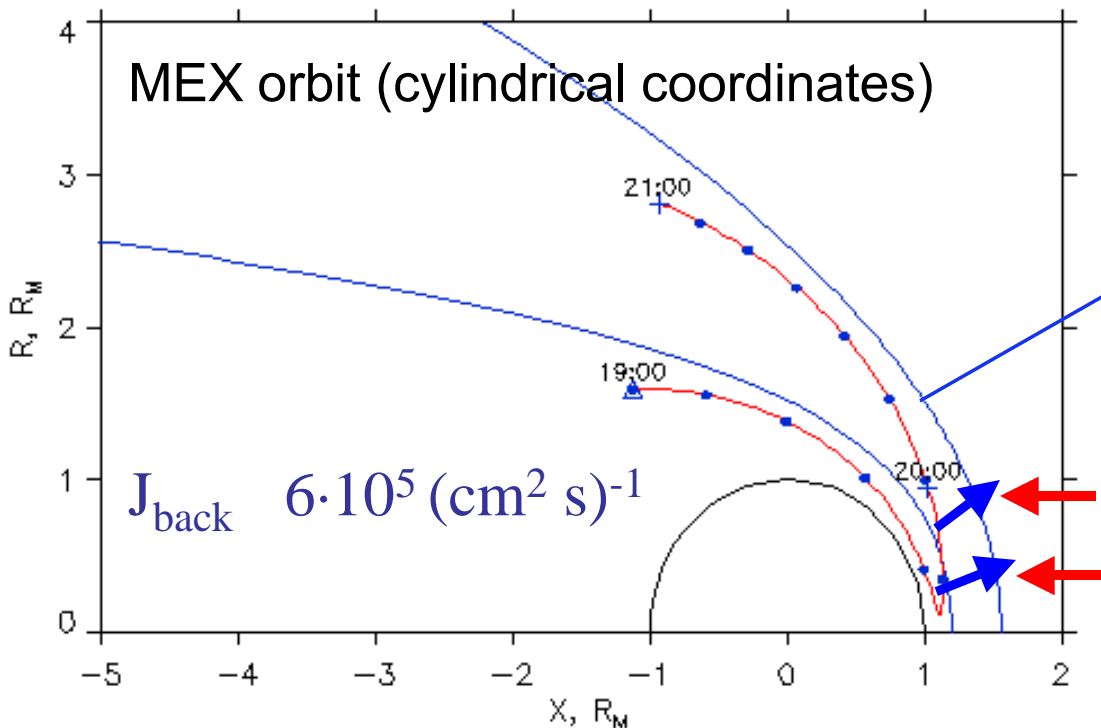


Ions



ASPERA-ENA's

- 1.3 keV H atoms emitted from the upper atmosphere !
- Large flux of backscattered hydrogen atoms from the upper atmosphere => energy deposition



Concluding remarks

- ASPERA not fully commissioned, but several new & unexpected findings have been made, such as:
- Strong fluxes of molecular ions in the planetary wind.
- Electron fine-structure (Auger lines) in the Martian ionosphere.
- Unusually high backscattered/ outflowing hydrogen ENAs from the dayside atmosphere - Mars is shining brightly with energetic neutral atoms.