Parker's Solar Wind Model

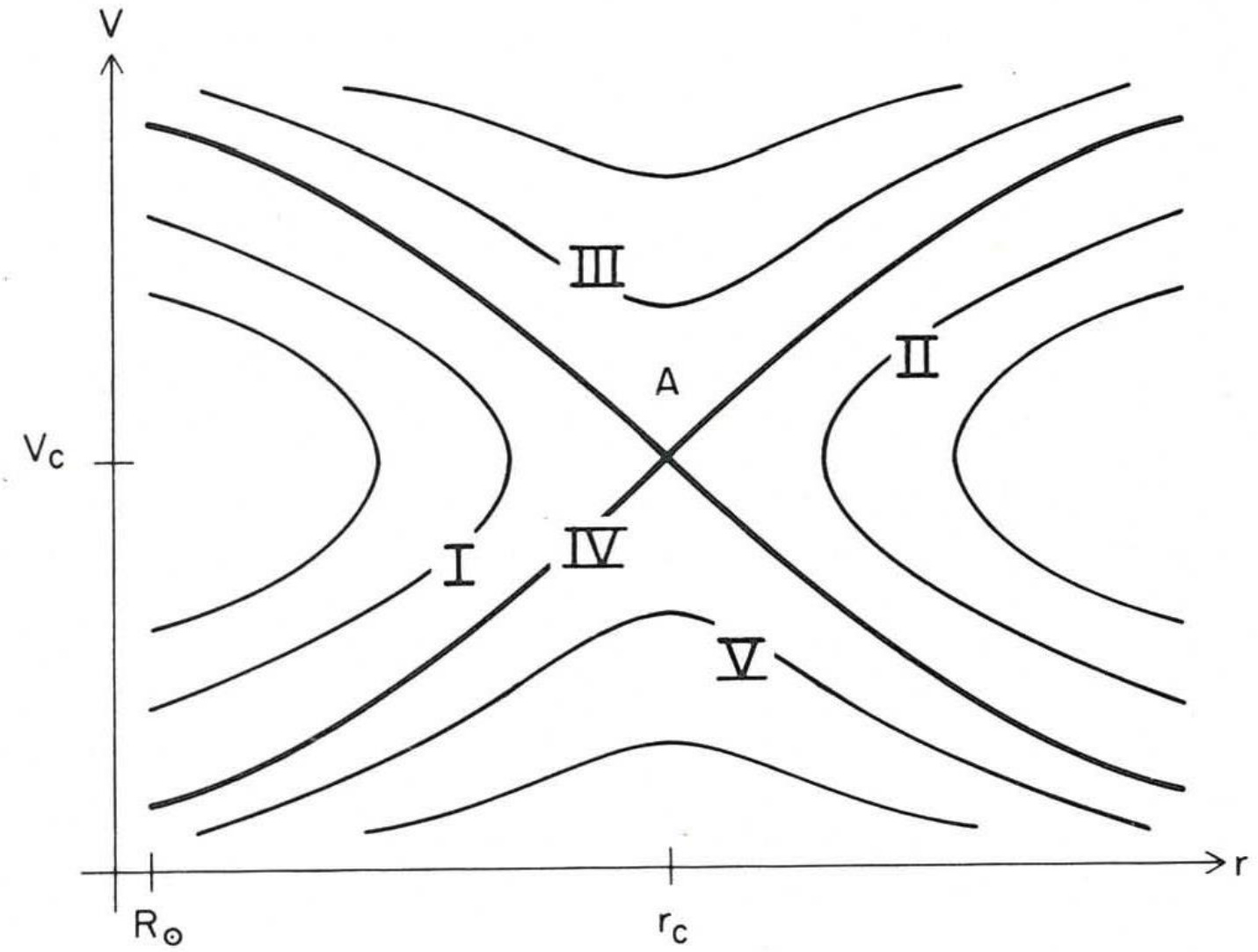


Fig. 12.1 in Priest

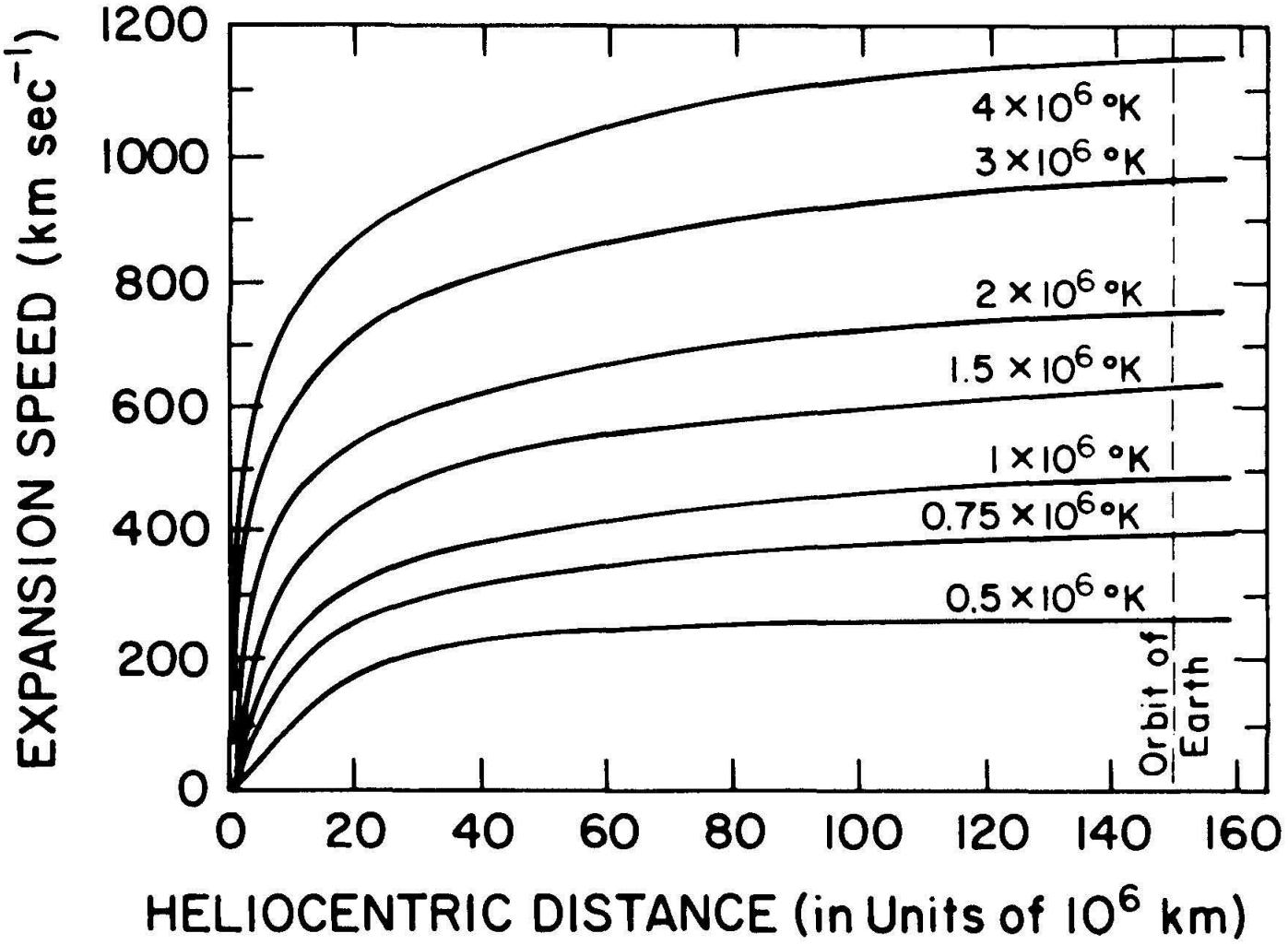
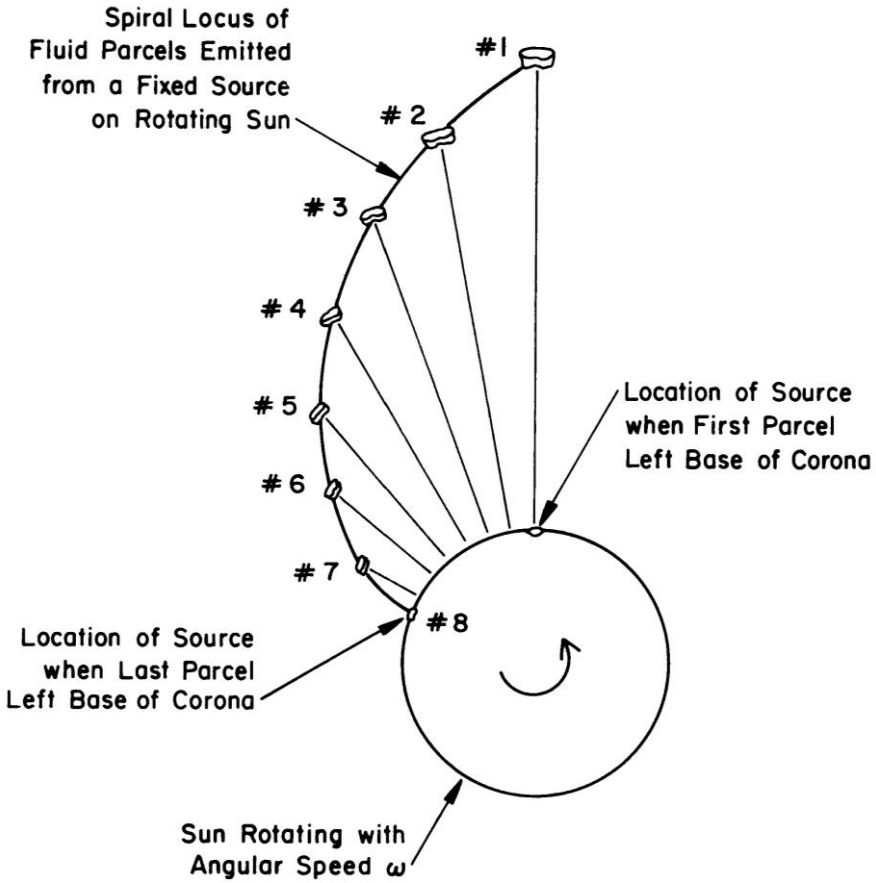


Fig. 4.3 in Kivelson & Russell

Parker Spiral



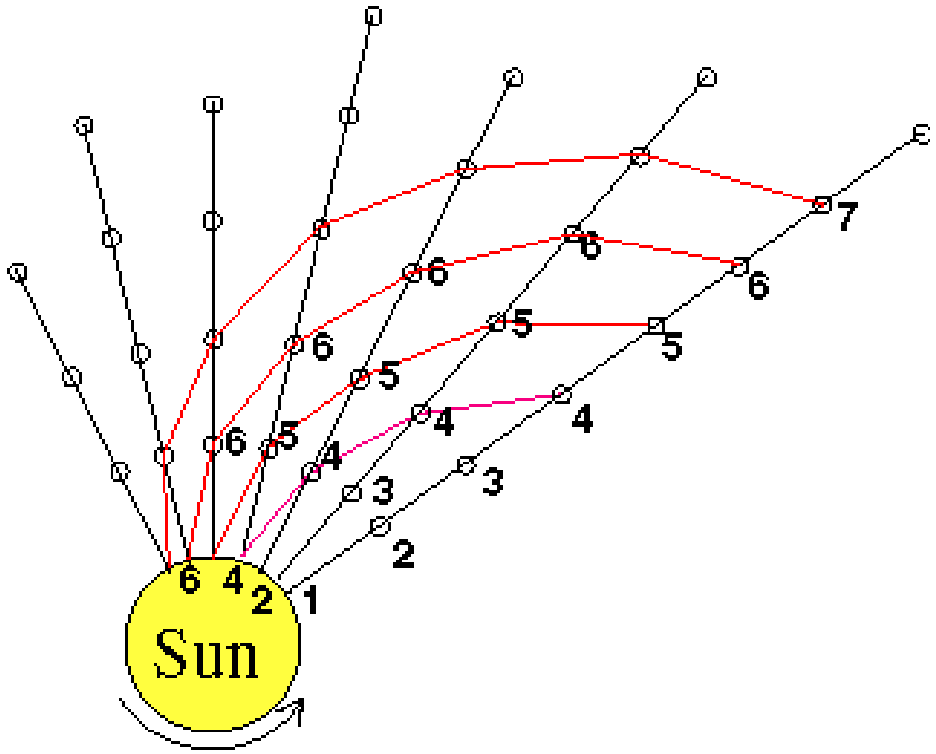


Fig. 4.5 in Kivelson & Russell

http://www.phy6.org/Education/wimfproj.html

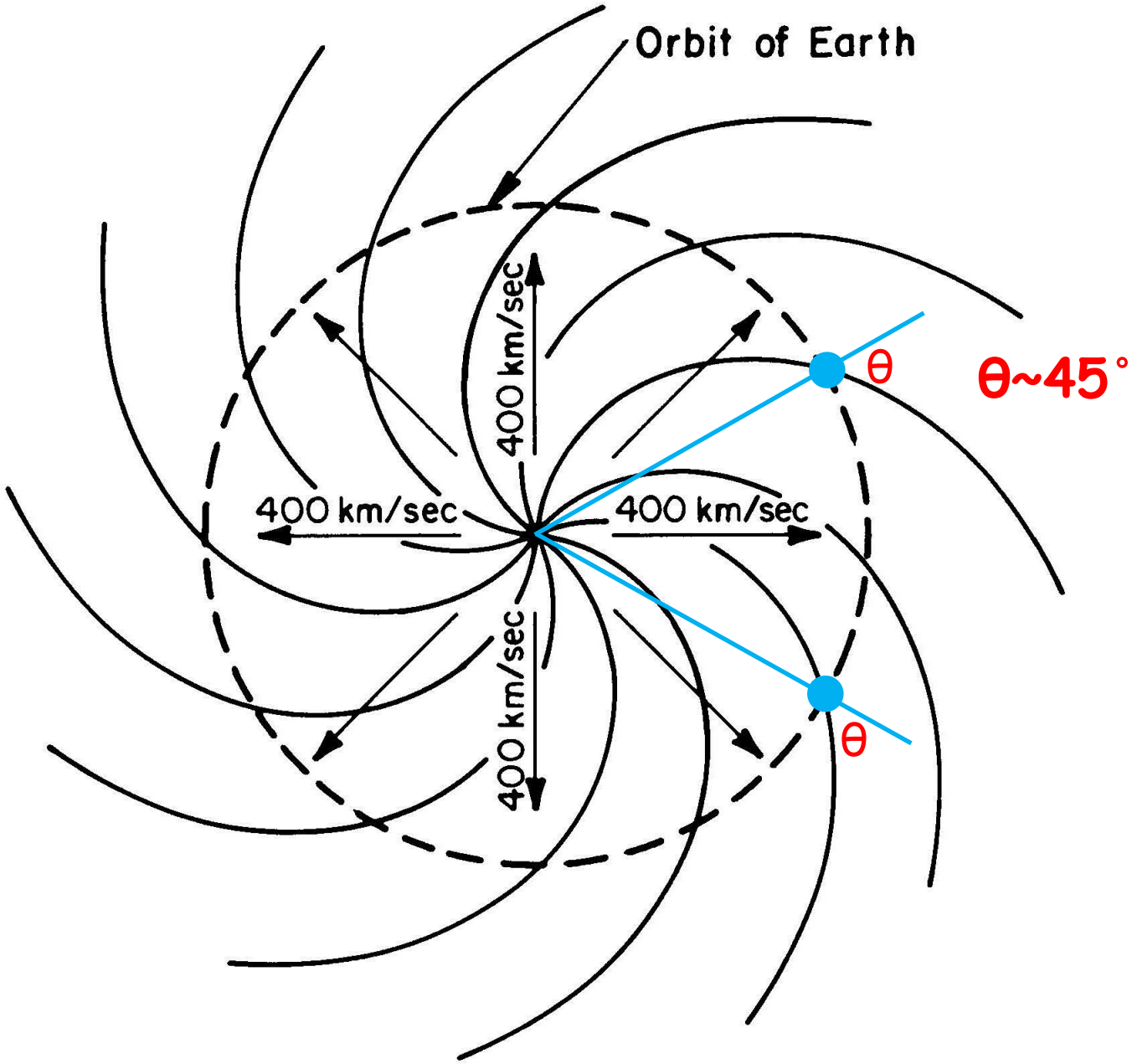
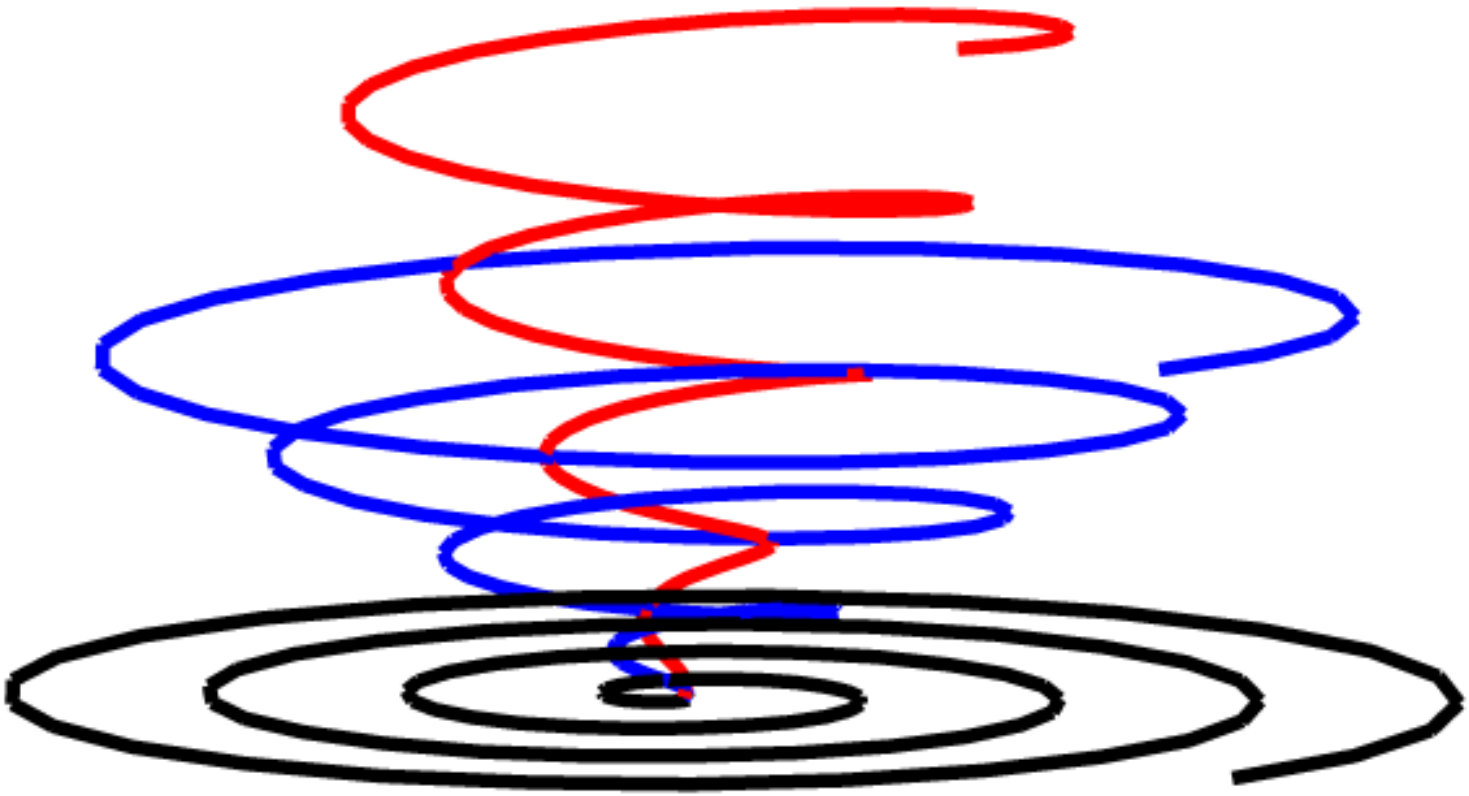


Fig. 4.6 in Kivelson & Russell

Ideal Parker spiral magnetic field lines between 0 and 25 AU for a solar wind speed of 450 km s^{-1}. Black, blue, and red lines show heliographic latitudes of 0, 30, and 60 degrees, respectively.



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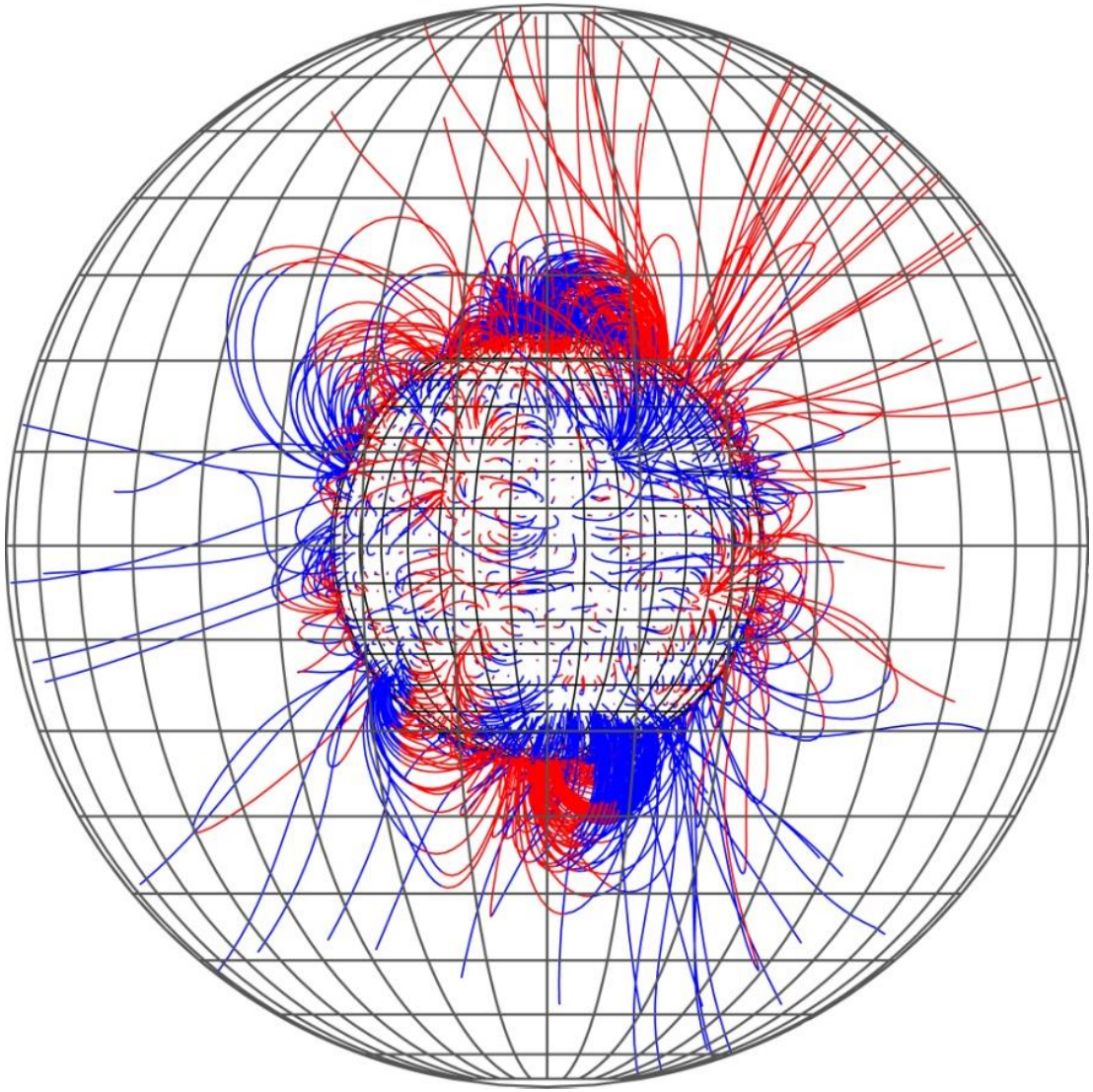
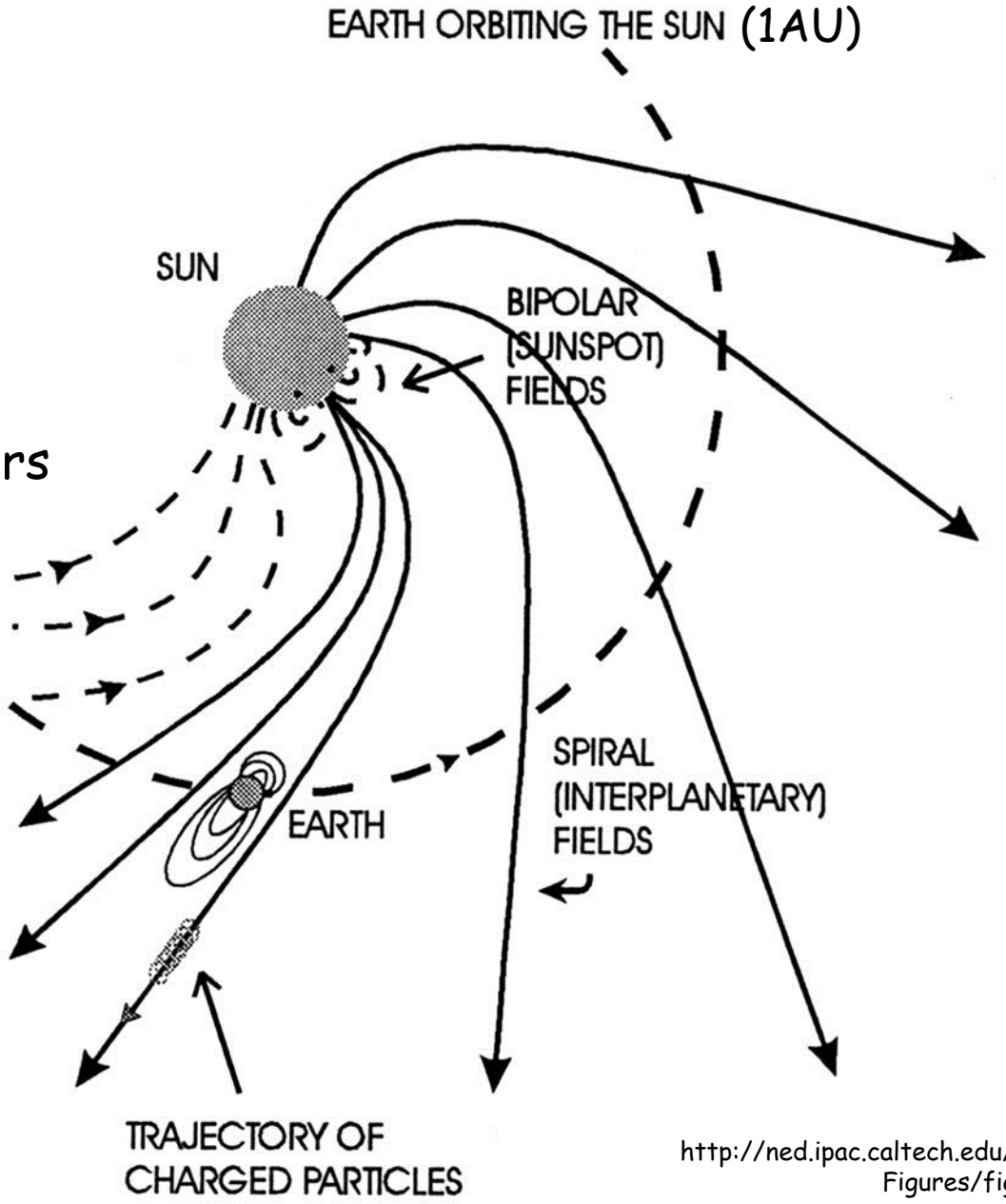
Source Surface

An imaginary sphere at 2.5 solar radii, beyond which solar wind flow becomes radial.



Magnetic Sector Structure

magnetic sectors



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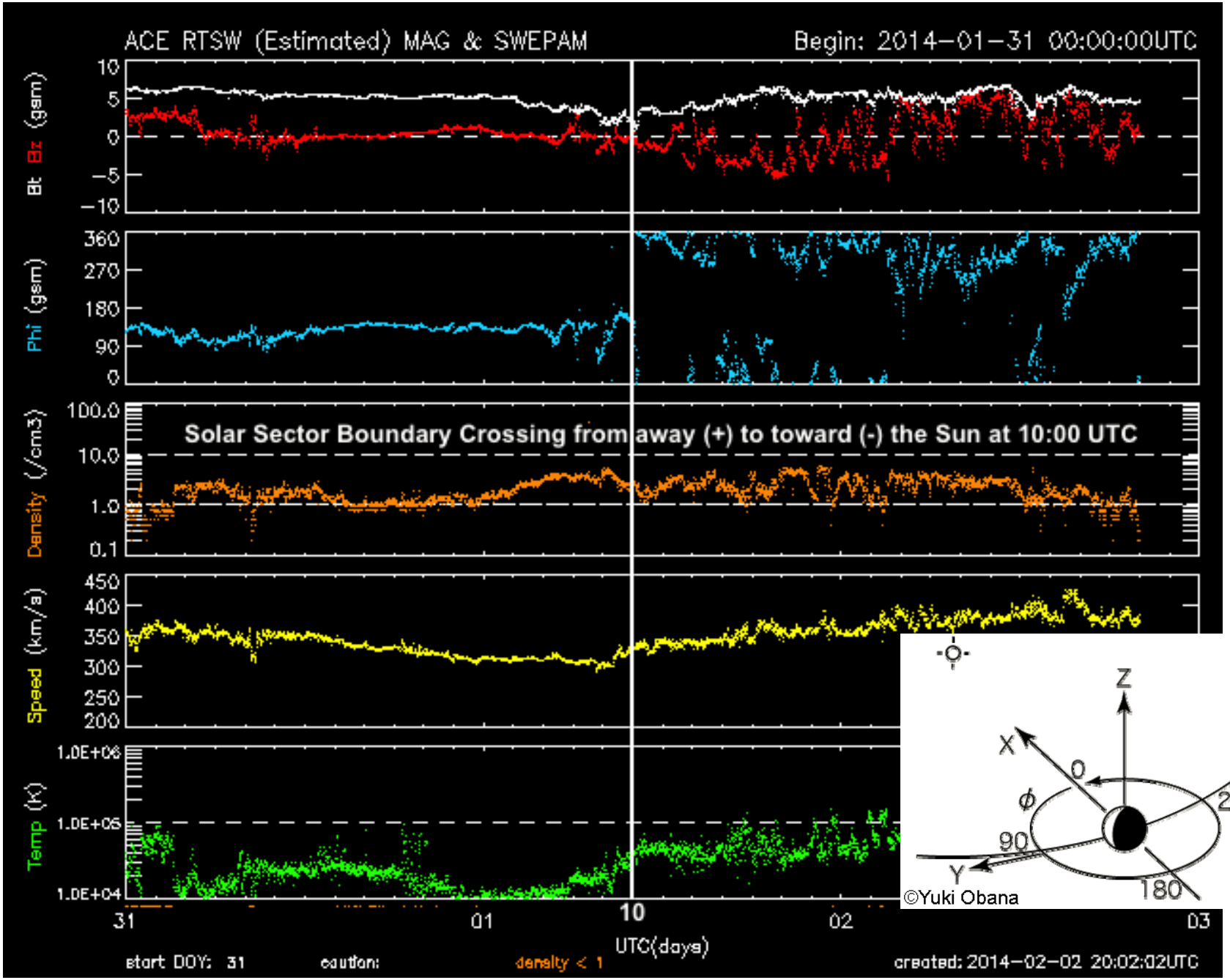
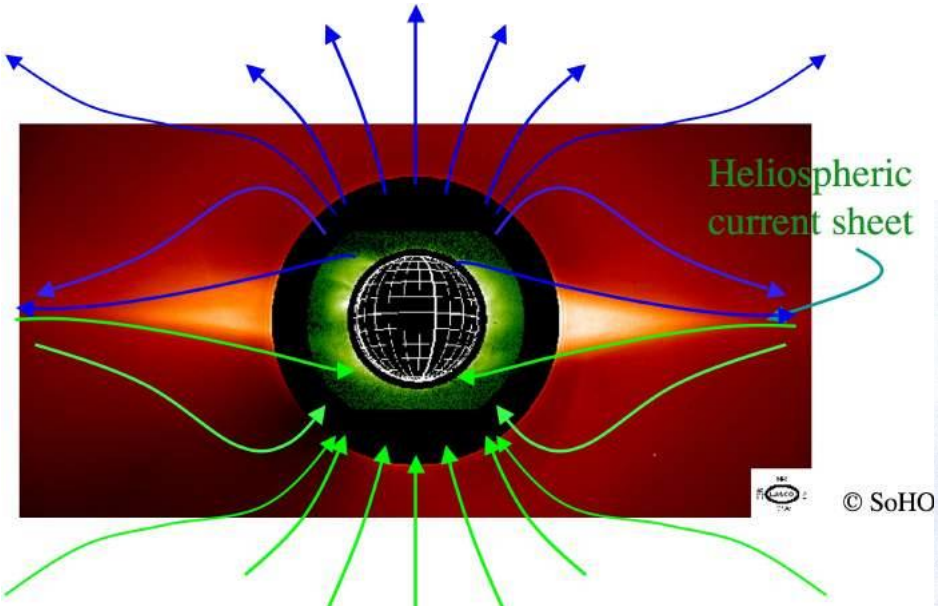
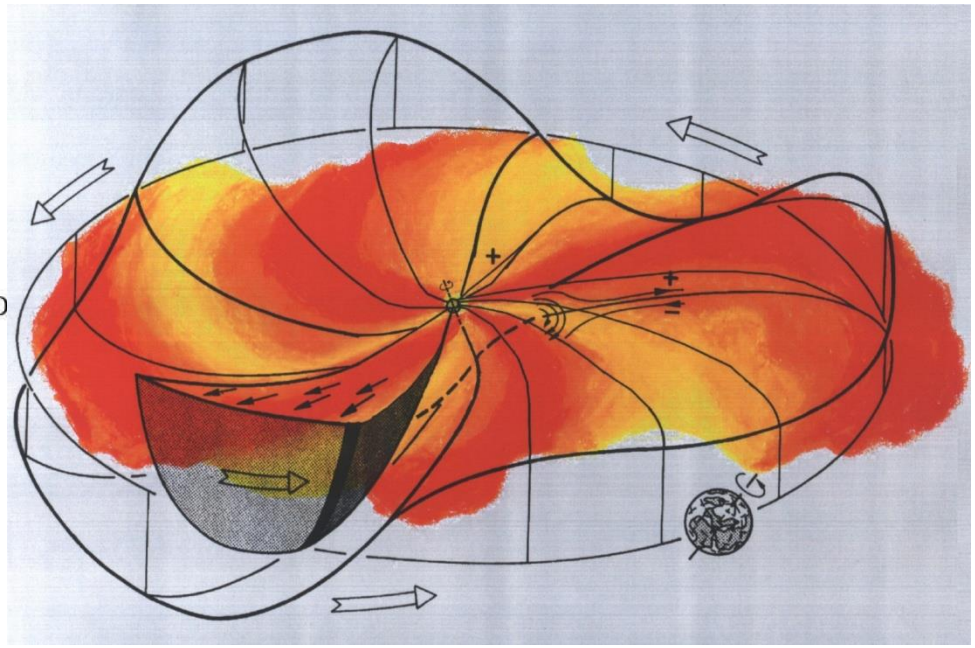


http://www.suspiciousObserverscollective.org/1/post/2014/02/solar-sector-boundary-crossing-on-february-1st-2014-research-notes.html

Heliospheric Current Sheet



http://www.nmdb.eu/?q=node/135



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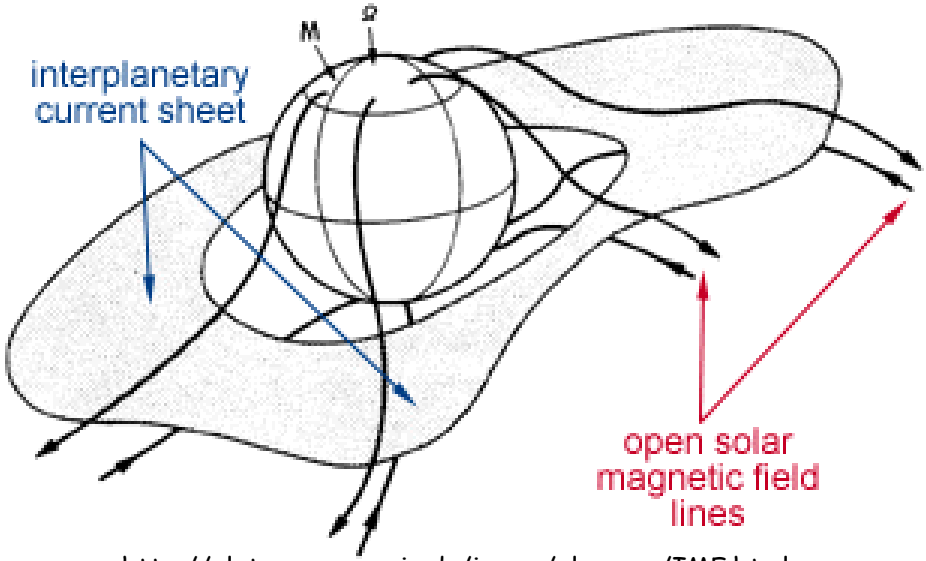


http://pluto.space.swri.edu/image/glossary/IMF.html

"ballerina skirt"

Table 1. Statistical Properties of the Solar Wind at 1 AU

Parameter	Mean	STD	Most Probable	Median	5-95% Range
n (/cm^3)	8.7	6.6	5.0	6.9	3.0 – 20.0
V_{sw} (km/s)	468	116	375	442	320 – 710
B (nT)	6.2	2.9	5.1	5.6	2.2 – 9.9
A(He)	0.047	0.019	0.048	0.047	0.017 – 0.078
T_p (x10^{5}K)	1.2	0.9	0.5	0.95	0.1 – 3.0
T_e (x10^{5}K)	1.4	0.4	1.2	1.33	0.9 – 2.0
T_α (x10^{5}K)	5.8	5.0	1.2	4.5	0.6 – 15.5
T_e/T_p	1.9	1.6	0.7	1.5	0.37 – 5.0
T_α/T_p	4.9	1.8	4.8	4.7	2.3 – 7.5
nV_{sw} (x10^8/cm^{2}s)	3.8	2.4	2.6	3.1	1.5 – 7.8
C_s (km/s)	63	15	59	61	41 – 91
C_A (km/s)	50	24	50	46	30 - 100

n is proton density, V_{sw} is solar wind speed, B is magnetic field strength, A(He) is He^{++}/H^+ ratio, T_p is proton temperature, T_e is electron temperature, T_α is alpha particle temperature, C_s is sound speed, C_A is Alfven speed.

The Sun yearly loses ~6.8 x 10^{19} g to the solar wind, a very small fraction of the total solar mass of ~2 x 10^{33} g.

Table 2. Average solar wind parameters at 1 AU, for the time around solar activity minimum.

	Slow wind	Fast wind
Flow speed v_P	250–400 km s^{-1}	400–800 km s^{-1}
Proton density n_P	10.7 cm^{-3}	3.0 cm^{-3}
Proton flux density $n_P v_P$	3.7×10^8 cm^{-2} s^{-1}	2.0×10^8 cm^{-2} s^{-1}
Proton temperature T_P	3.4×10^4 K	2.3×10^5 K
Electron temperature T_e	1.3×10^5 K	1×10^5 K
Momentum flux density	2.12×10^8 dyn cm^{-2}	2.26×10^8 dyn cm^{-2}
Total energy flux density	1.55 erg cm^{-2} s^{-1}	1.43 erg cm^{-2} s^{-1}
Helium content	2.5%, variable	3.6%, stationary
Sources	Streamer belt	Coronal holes

https://www.cfa.harvard.edu/~scranmer/ITC/eaaa_solar_wind_schwenn.pdf

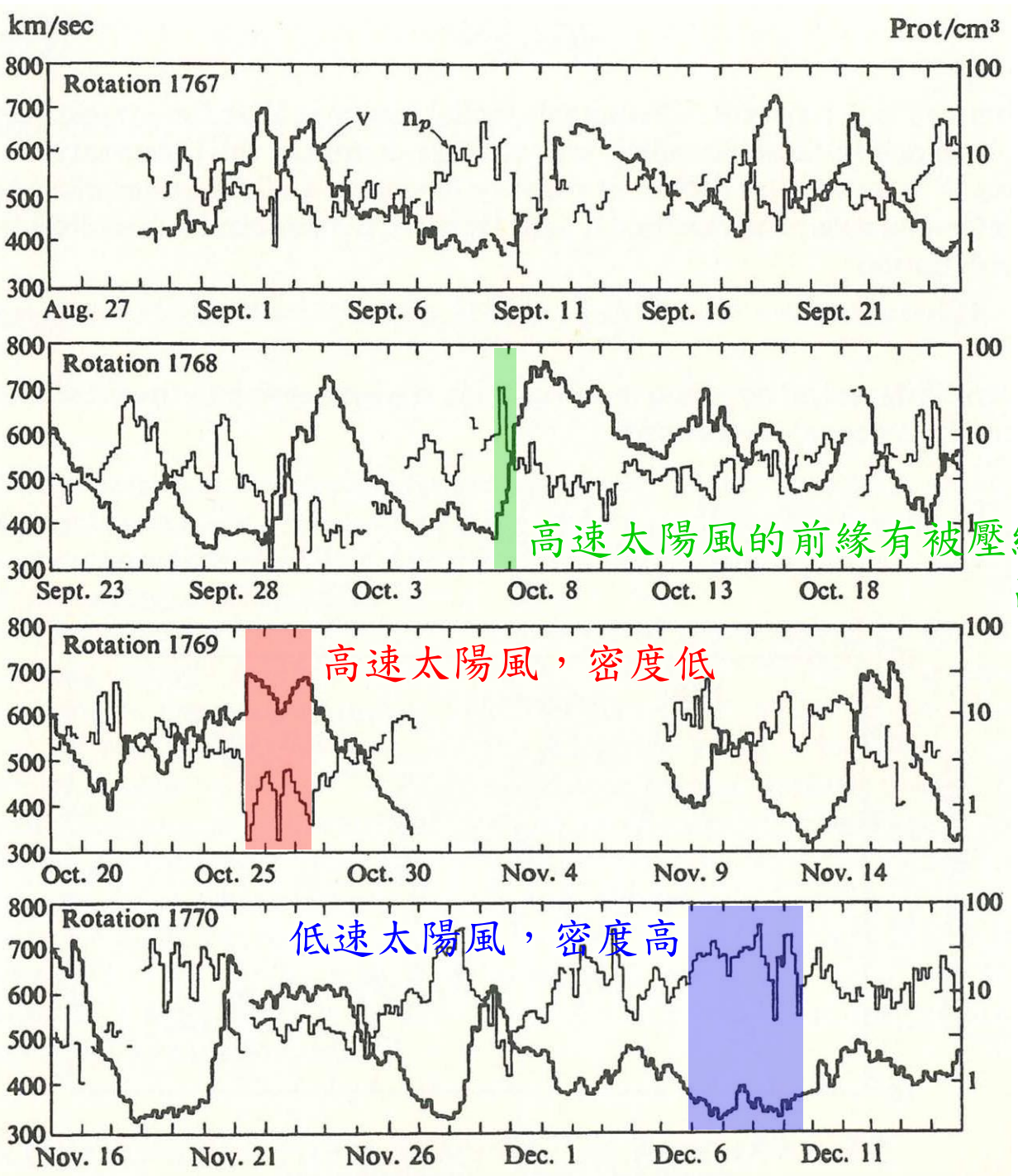
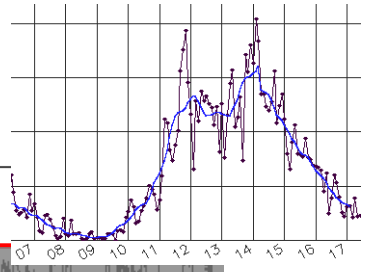
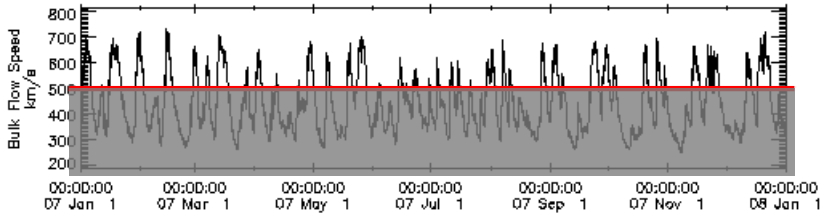
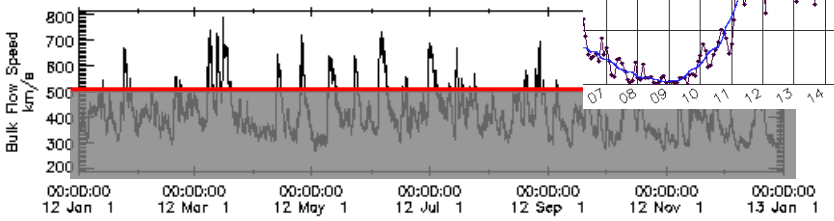


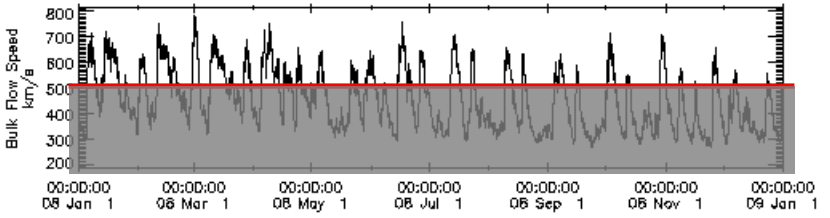
Fig. 6.8 in Parks

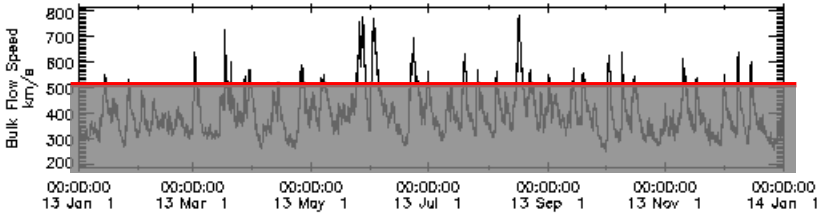
Solar Wind Speed during 2007-2016

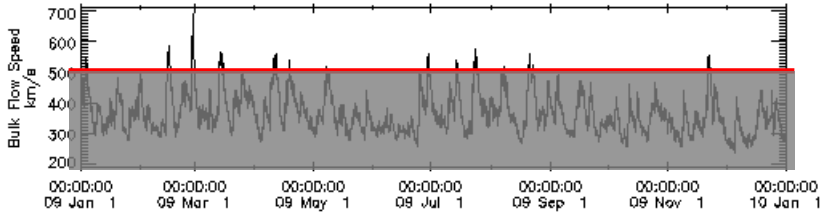


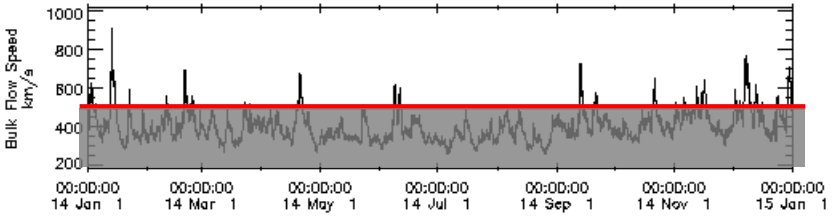


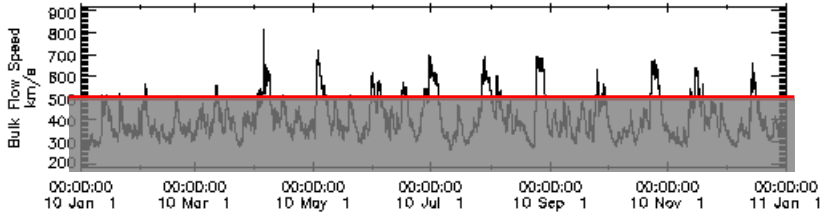


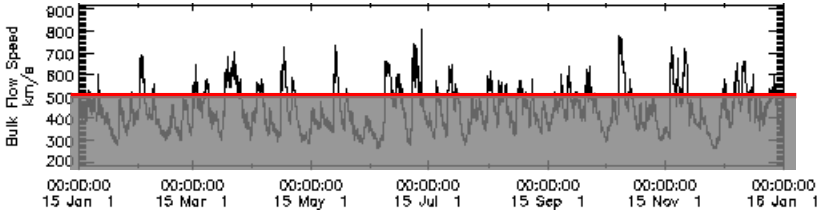


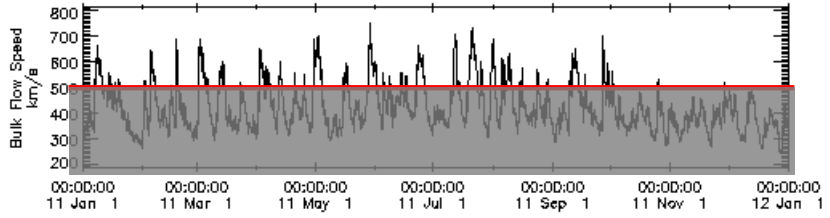


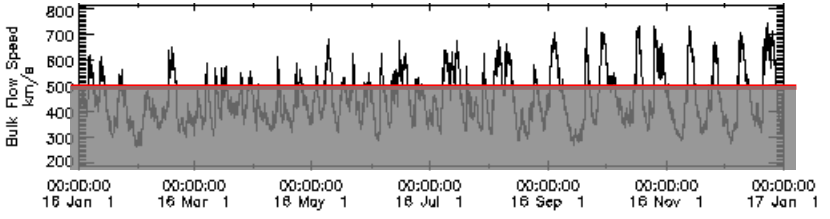


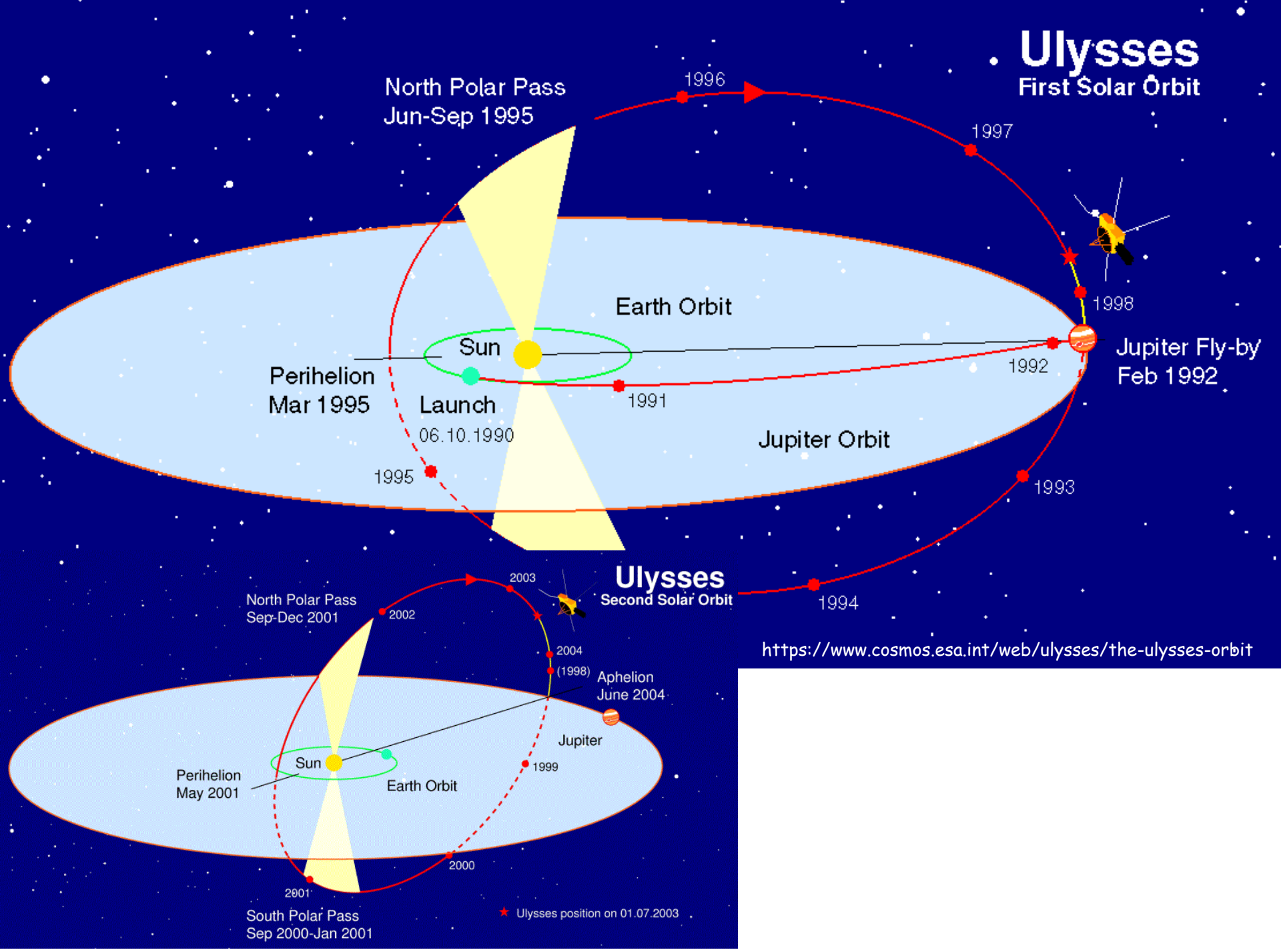








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First Solar Orbit
North Polar Pass
Jun-Sep 1995
1996
1997
1998
1992
1991
1993
1994
1995
Earth Orbit
Sun
Perihelion
Mar 1995
Launch
06.10.1990
Jupiter Orbit
Jupiter Fly-by
Feb 1992
Ulysses
Second Solar Orbit
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May 2001
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2000
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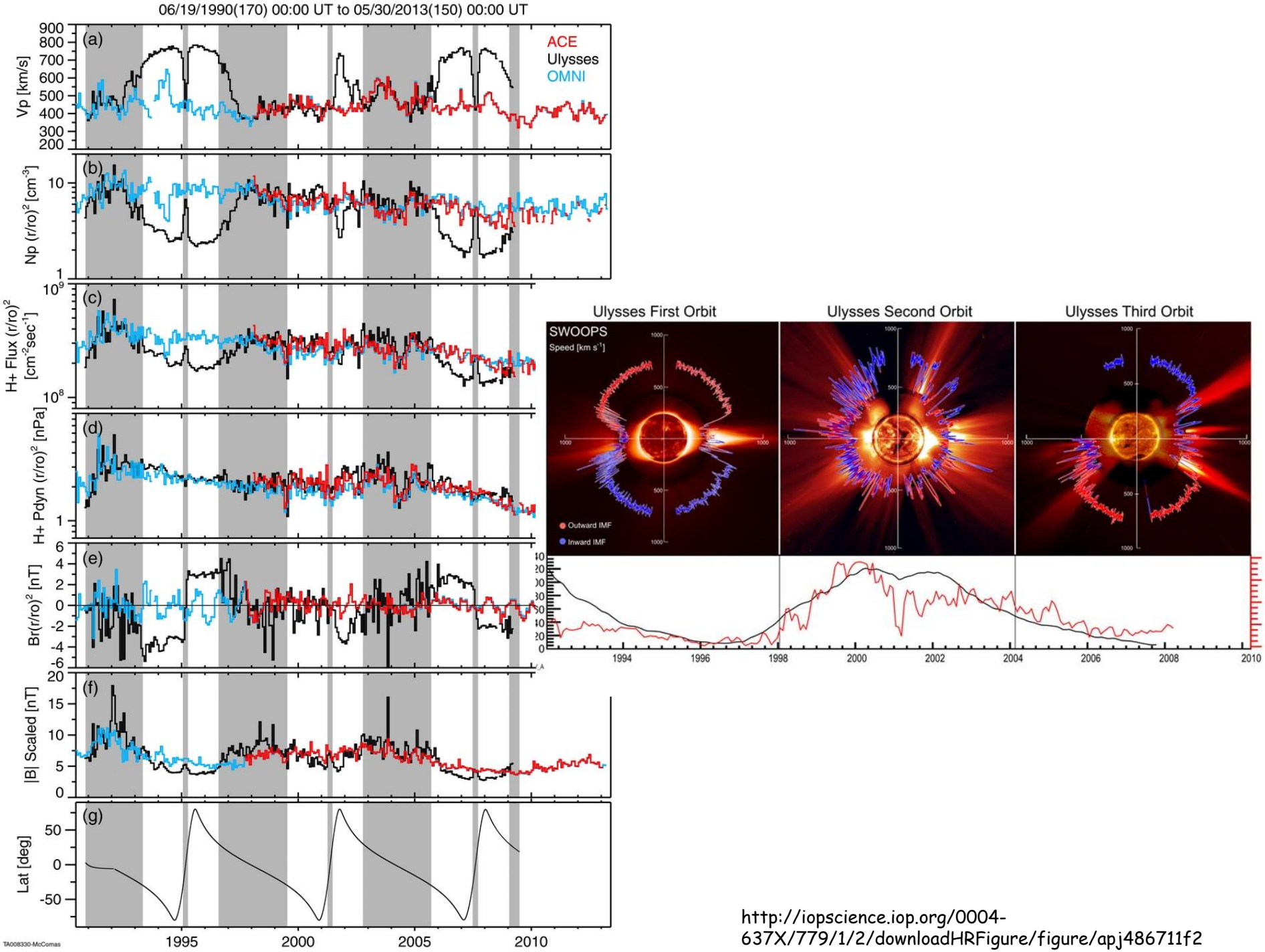

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