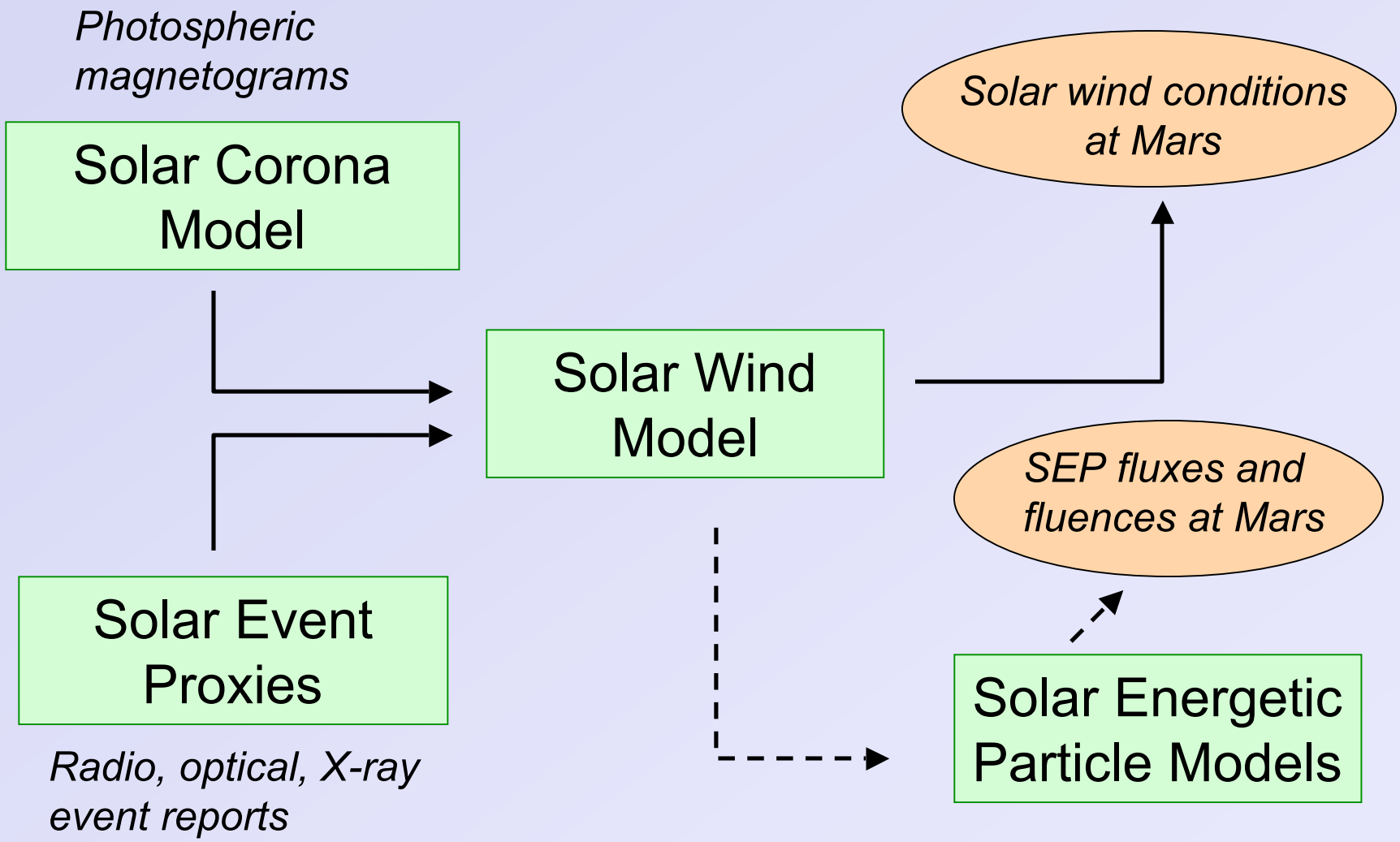
A Solar Observation-Based Mars Space Weather Prediction System



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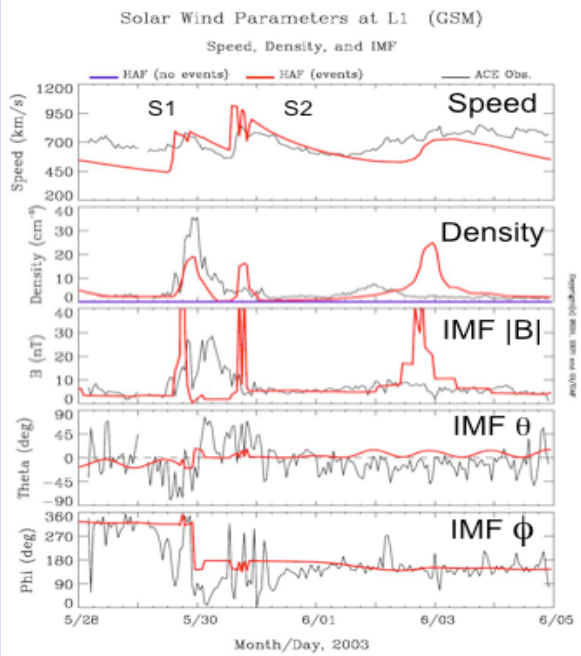
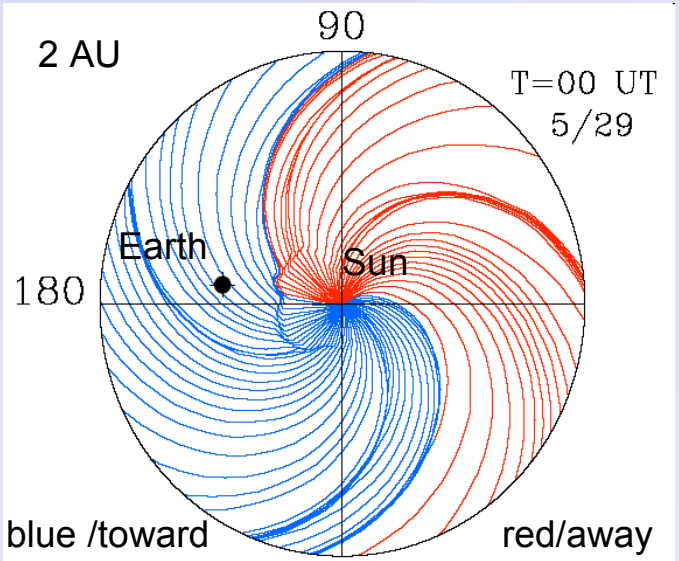
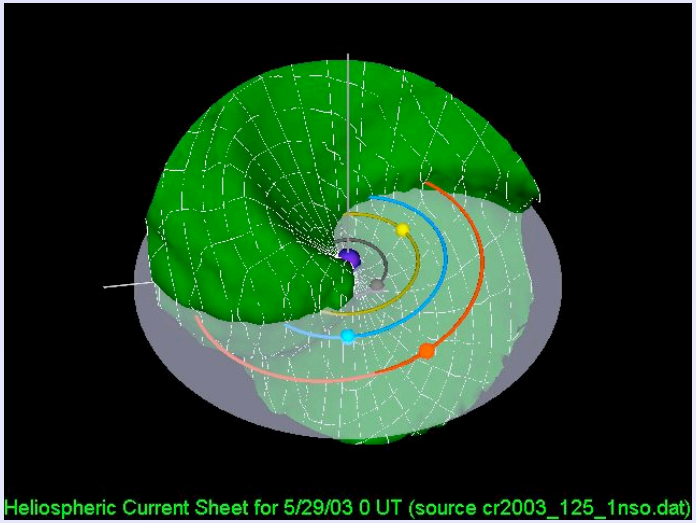
5 Day Forecast @ L1



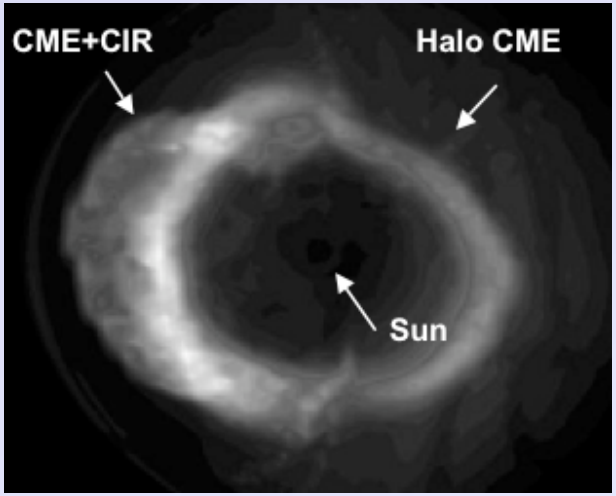
Ecliptic Plane IMF



Heliospheric Current Sheet



CME Forecast



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Outstanding flares during 6-27 March 1989.

McKenna-Lawlor et al., *J. Geophys. Res.,* 2005, Table 3.

Flare Event	Location	Day/Time Mar.89/UT	Classif. X-ray/Opt.	Vs* km/s	Tau Mins	SSC/SI Mar.89/UT
I	N35 E69	6/1352	X15/3B	1200	120	9/1900
II	N30 E40	9/1011	M7.6/2N	2000	10	10/1600
III	N31 E22	10/1900	X4/3B	1120	180	13/0100
IV	N33 W60	17/1744	X6/2B	2500	60	19/0200
V	S25 E76	20/2045	M3.1/2	1500	180	23/1200
VI	N18 W28	23/1939	X1.5/3B	----	---	---

* Vs values were found by HAFv.2 iteration, using SSC or SI times at Earth since the metric Type II coronal shock speeds were not recorded in the NGDC archive during this period.

Red: Source event of the famous March 89 geomagnetic storm responsible for the Hydro-Quebec power outage.

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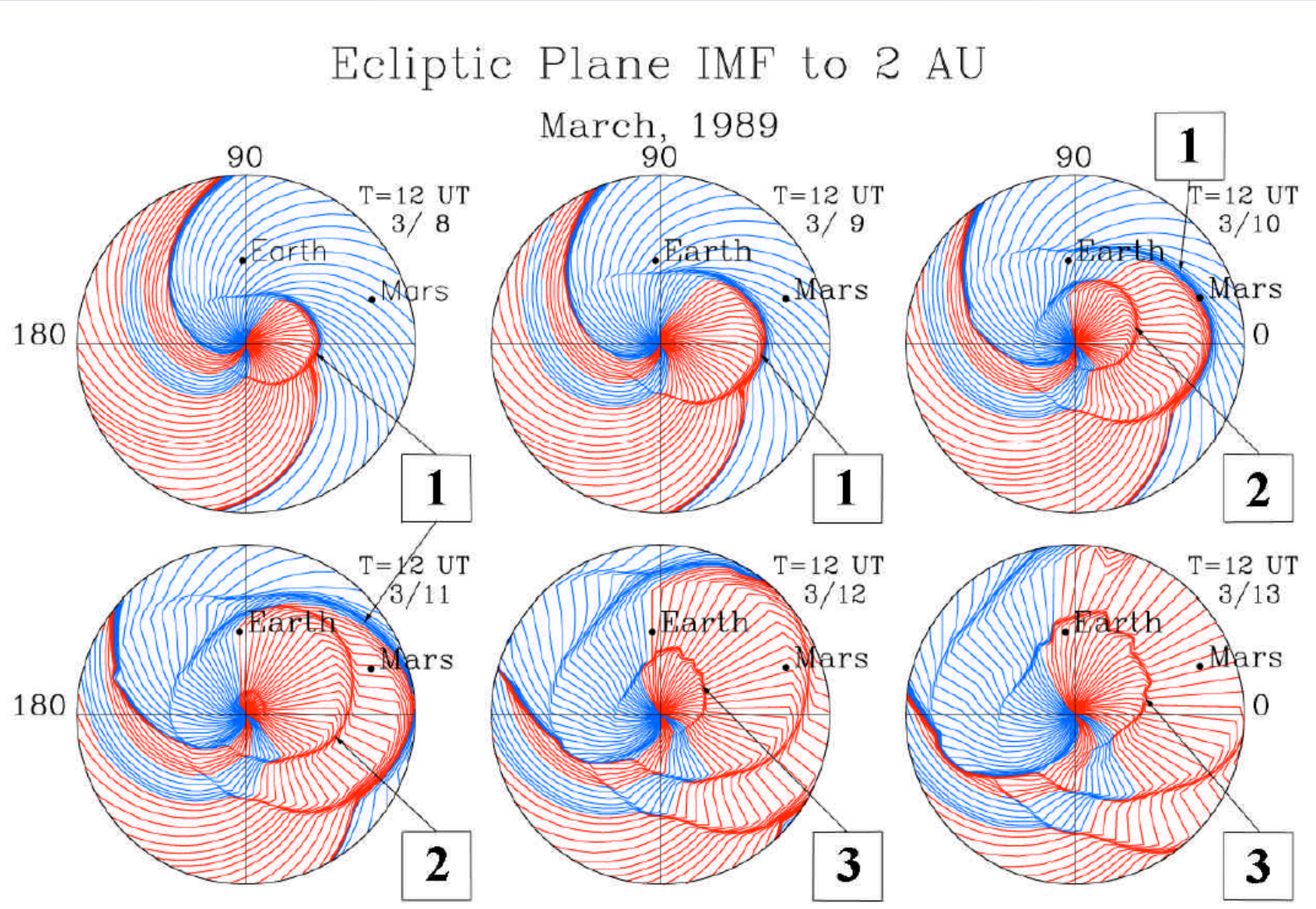

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Phobos-2 Observations at Mars

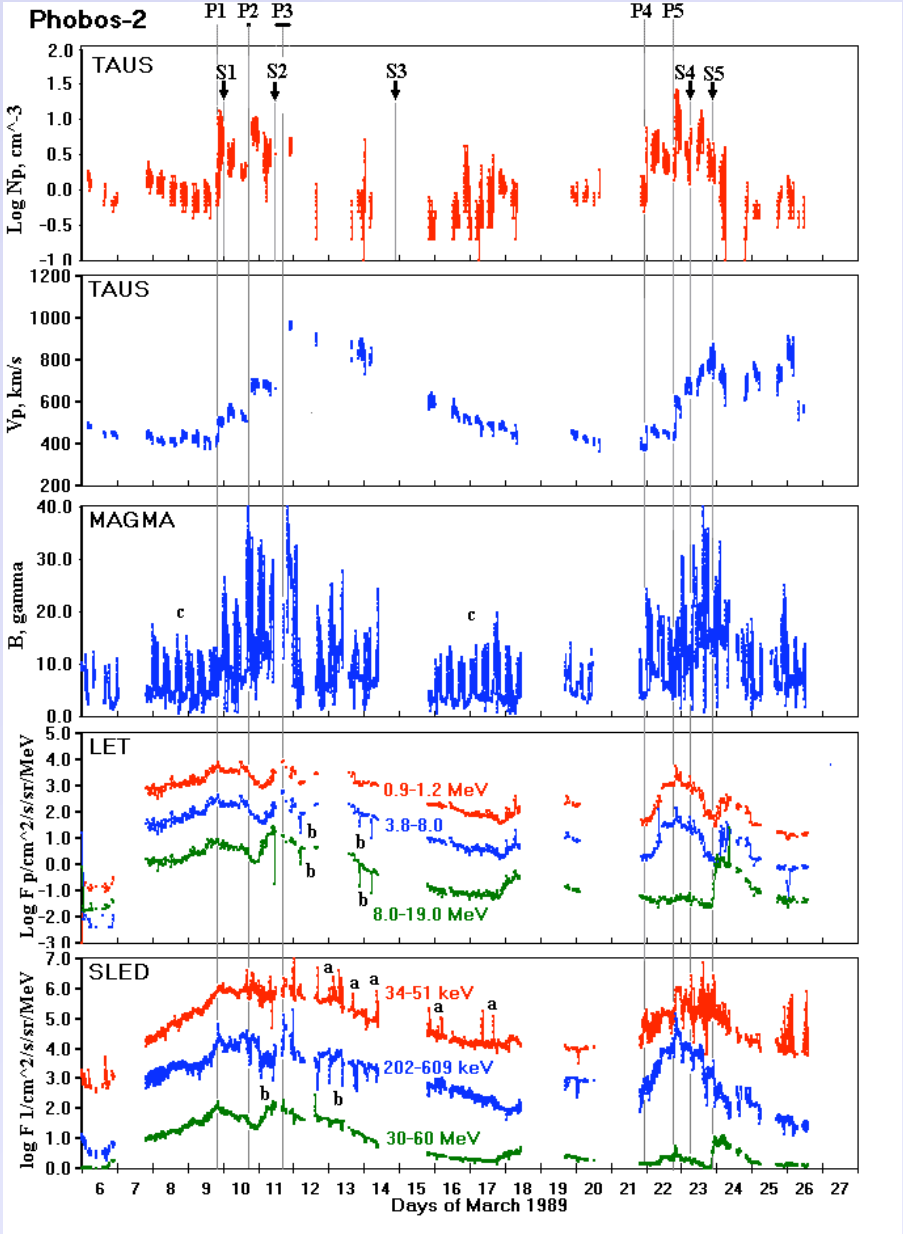
Density
(TAUS instrument)

Plasma speed
(TAUS instrument)

Magnetic field
(MAGMA instrument)

Particle flux
(LET instrument)

Proton flux
(SLED instrument)



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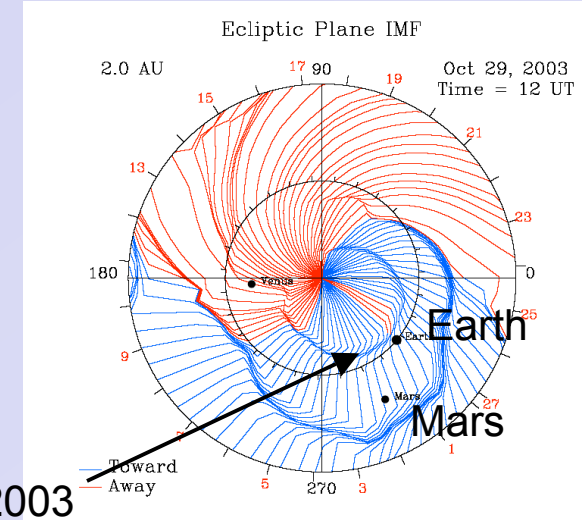
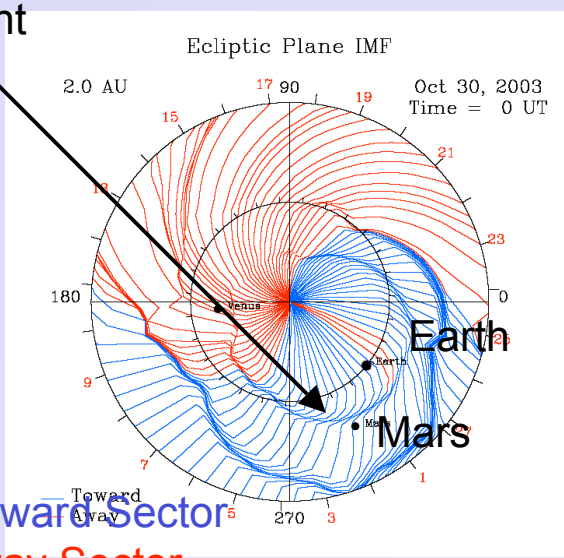
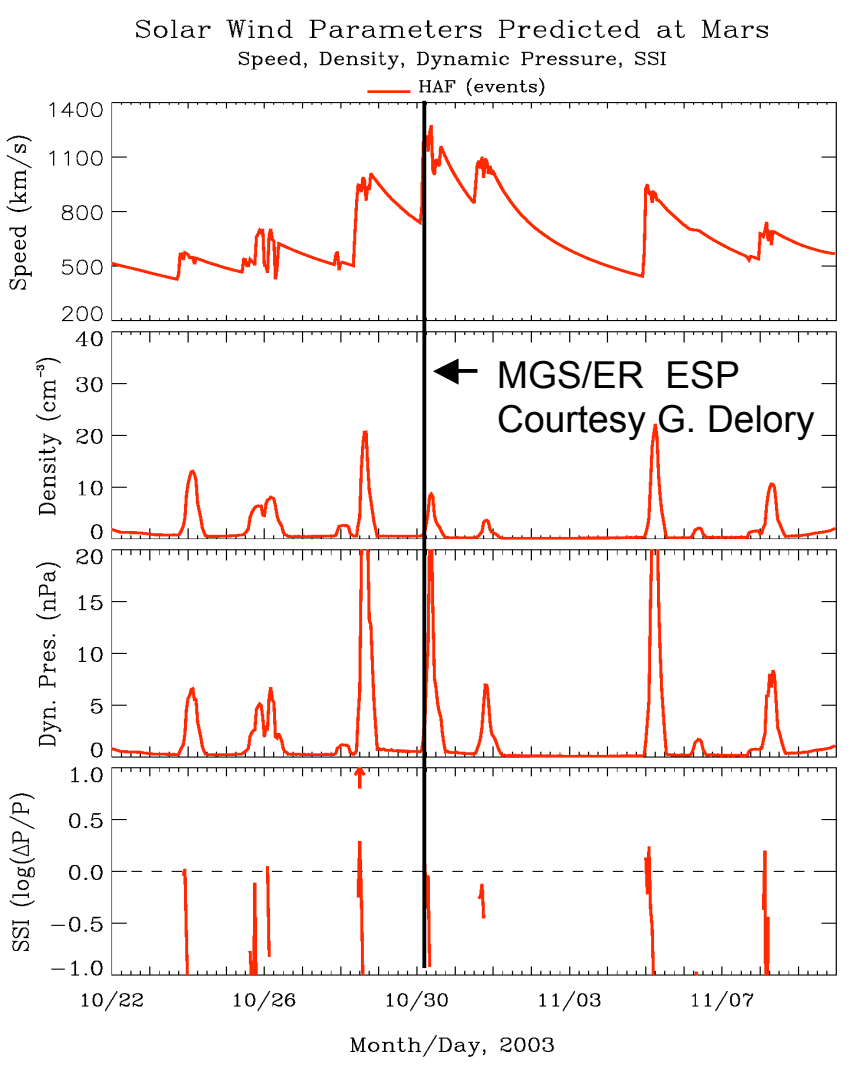
Halloween 2003 Solar Wind Forecasts at Mars



Oct. 28, 2003
X17 Event



Blue = Toward Sector
Red = Away Sector



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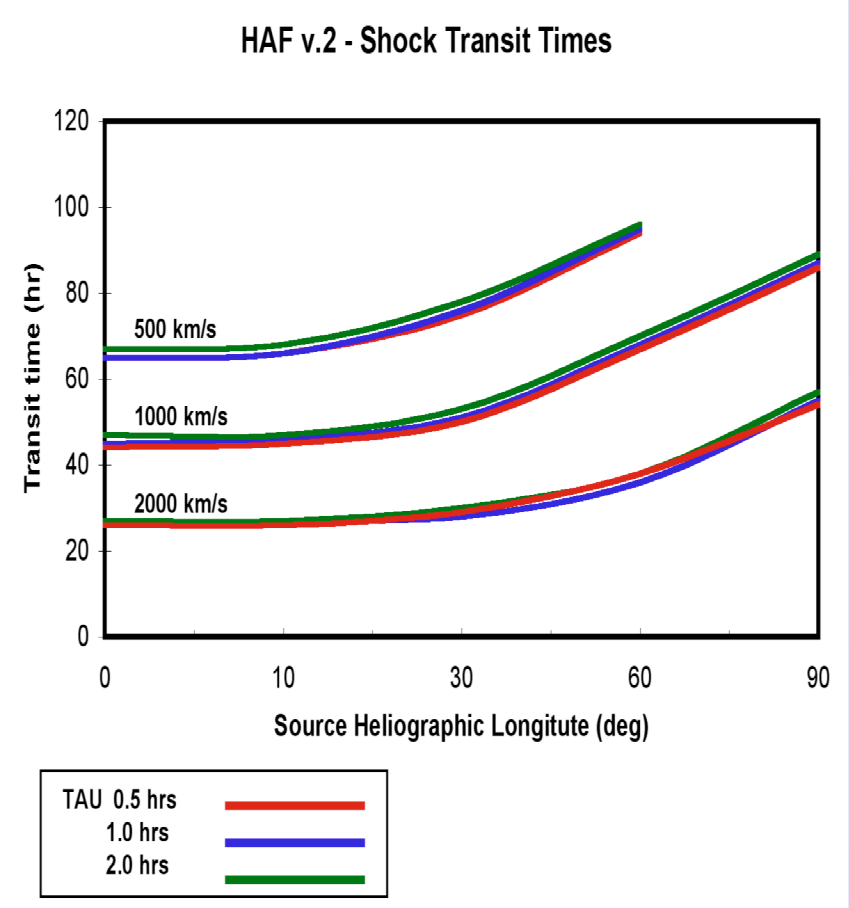
Observational Uncertainties

Conclusions

- Faster shocks have shorter transit times.
- Central Meridian events get here faster than limb events.
- Uncertainties in helio-longitude have larger impact in TT for limb events.
- Shock driving time has minimal effect.
- Largest uncertainty is estimate of driver speed.
- Relevant to all solar wind models.



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