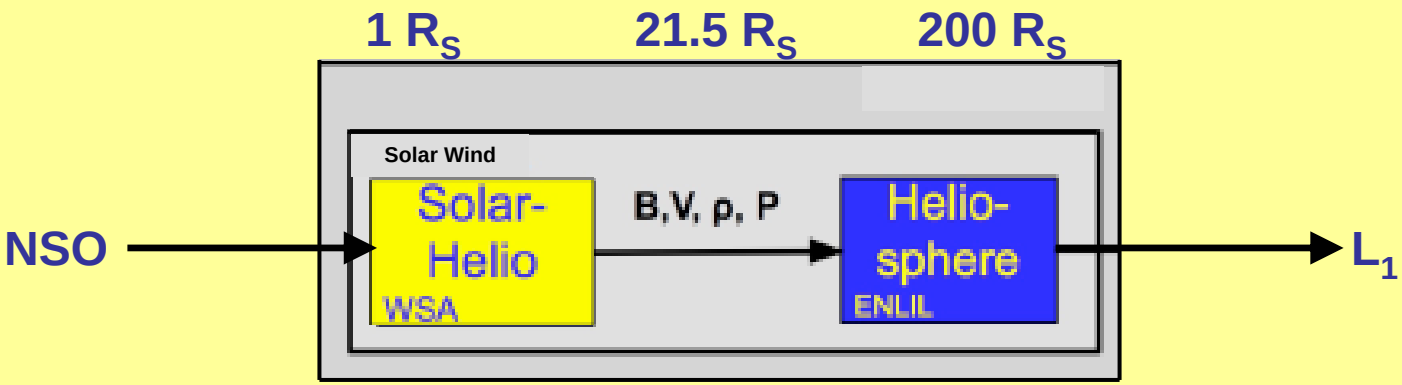
Forecasting the Solar Wind in the Inner Heliosphere

1. Solar Wind Model
2. Model Validation and Verification
3. Solar Wind Forecast Products
4. STEREO Beacon Support

Solar Wind Model



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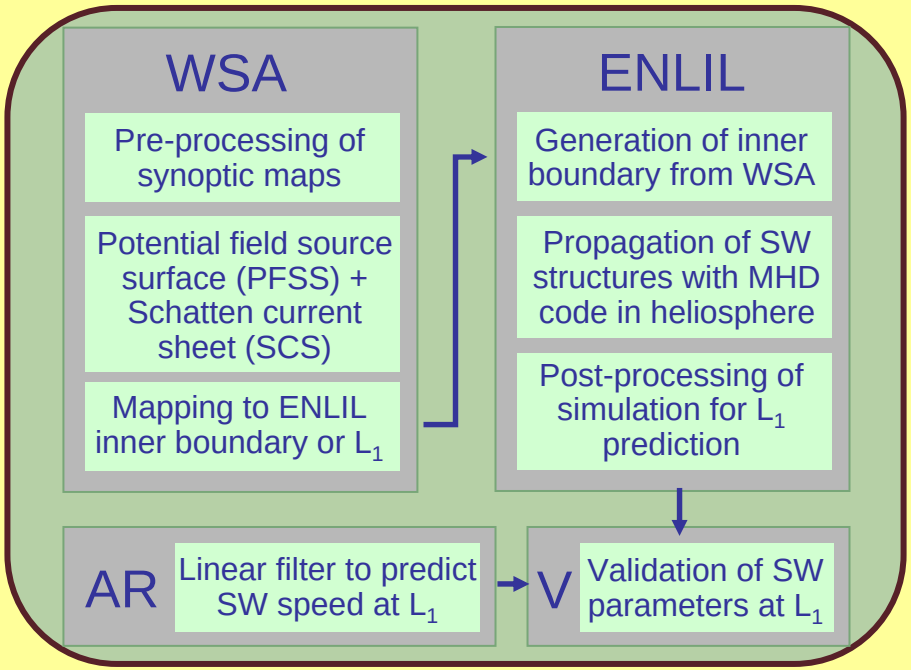
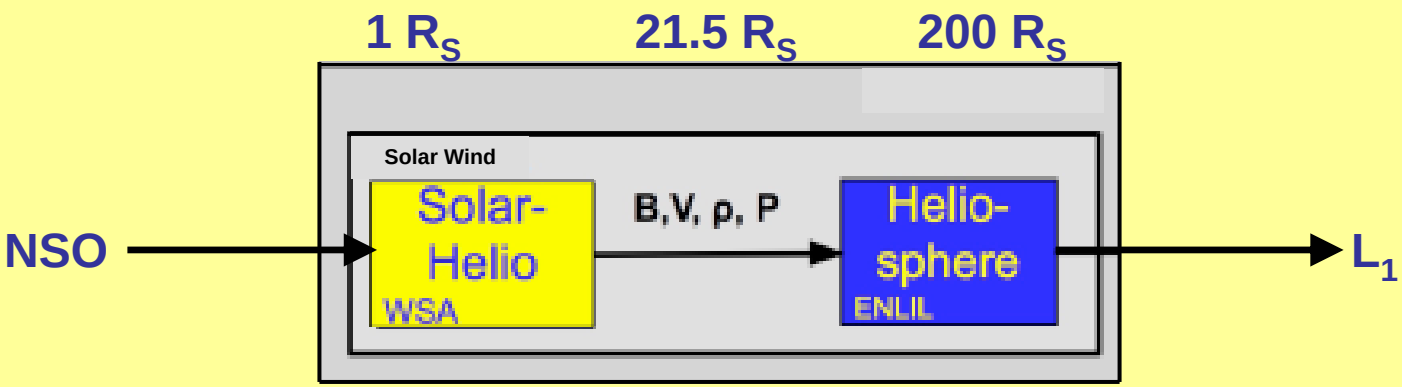
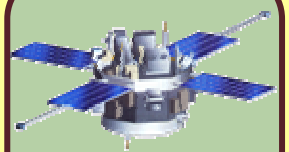




Solar Wind Model

Daily SOLIS synoptic maps



Real-time Solar Wind Data at L_1

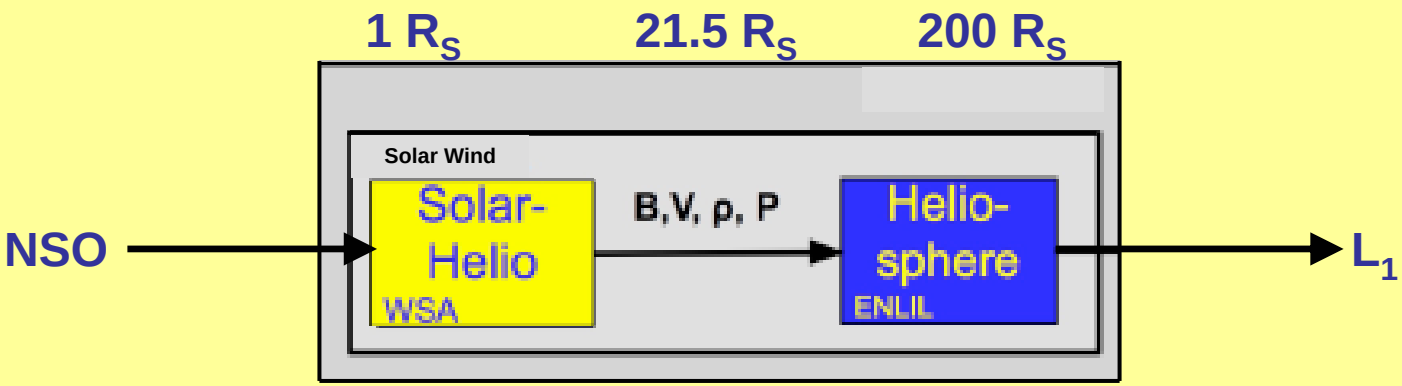
WSA

- Pre-processing of synoptic maps
- Potential field source surface (PFSS) + Schatten current sheet (SCS)
- Mapping to ENLIL inner boundary or L_1

ENLIL

- Generation of inner boundary from WSA
- Propagation of SW structures with MHD code in heliosphere
- Post-processing of simulation for L_1 prediction

AR Linear filter to predict SW speed at L_1 → **V** Validation of SW parameters at L_1



Solar Wind Model

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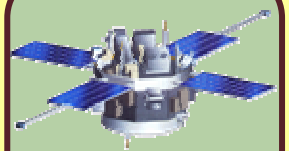

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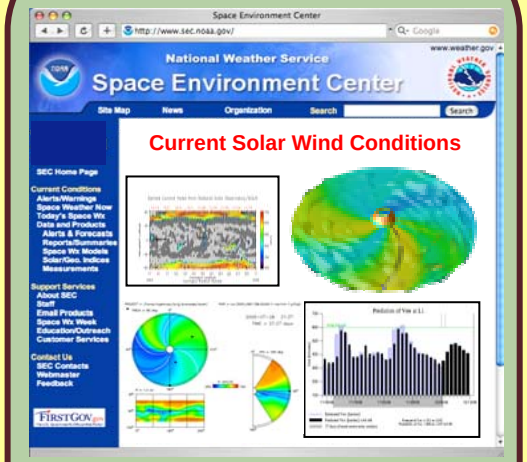
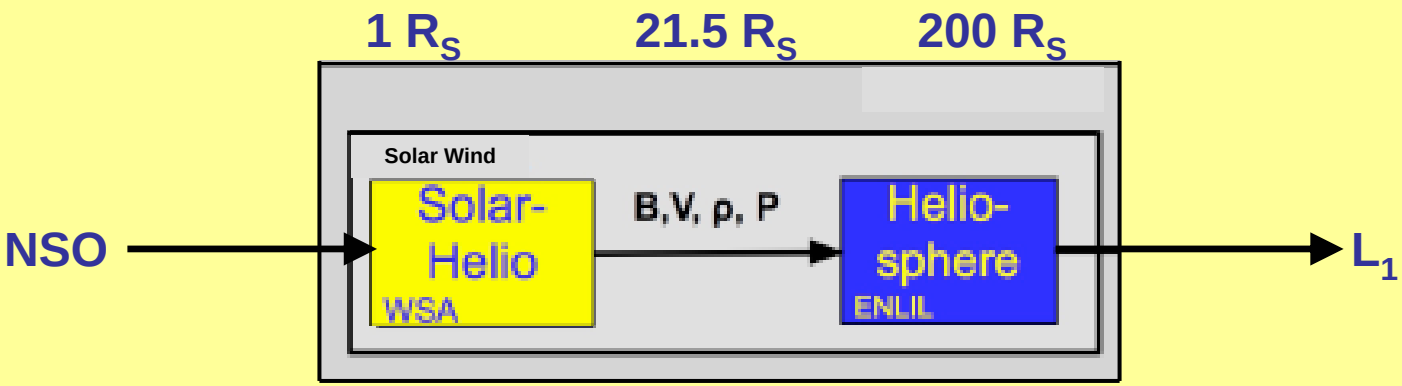
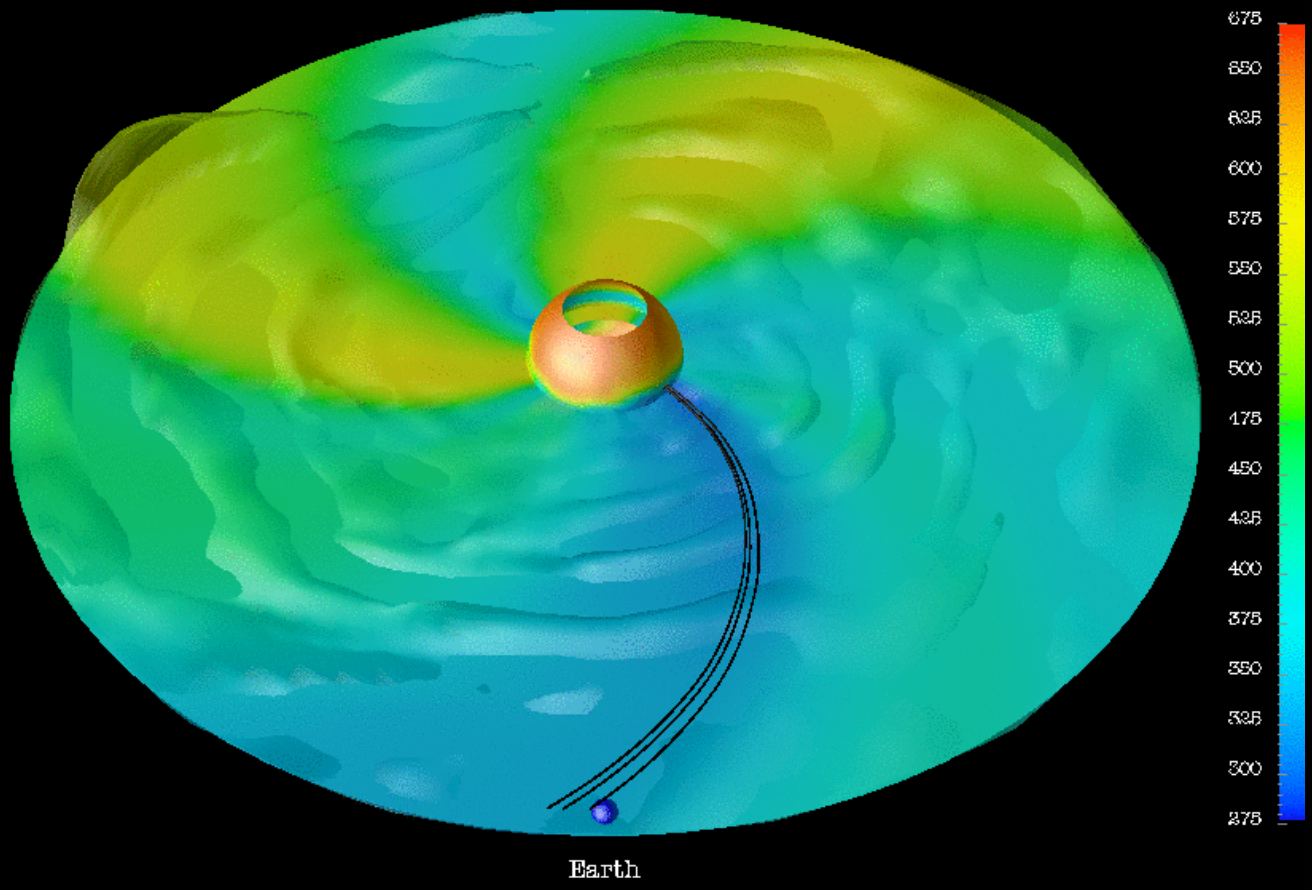


Space Weather Forecast (SEC)



Solar Wind Model

Example: CR 1896

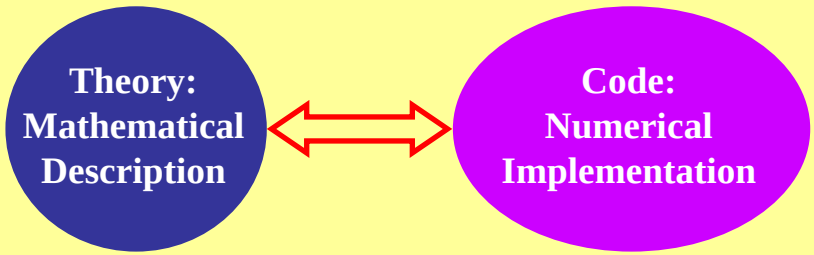


Model Validation and Verification

Model Validation and Verification

Validation
solving the right equations

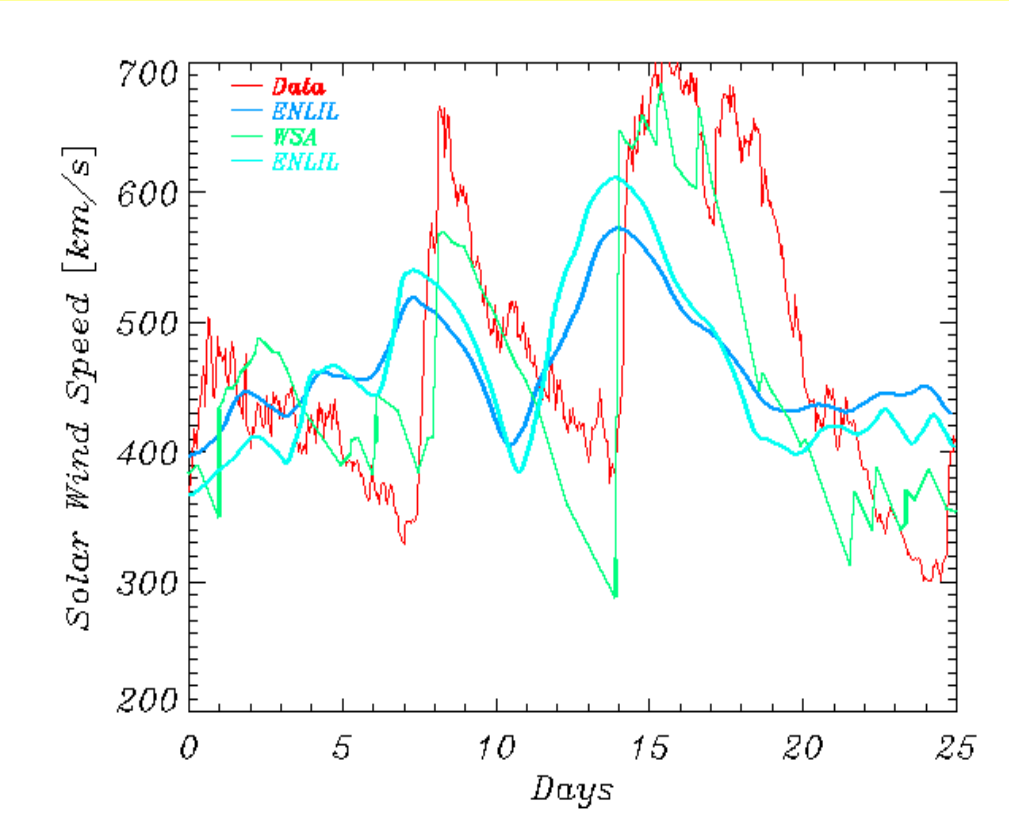
Verification
solving the equations right



Reference: H. Roache, JASTP 66, 1499, 1998

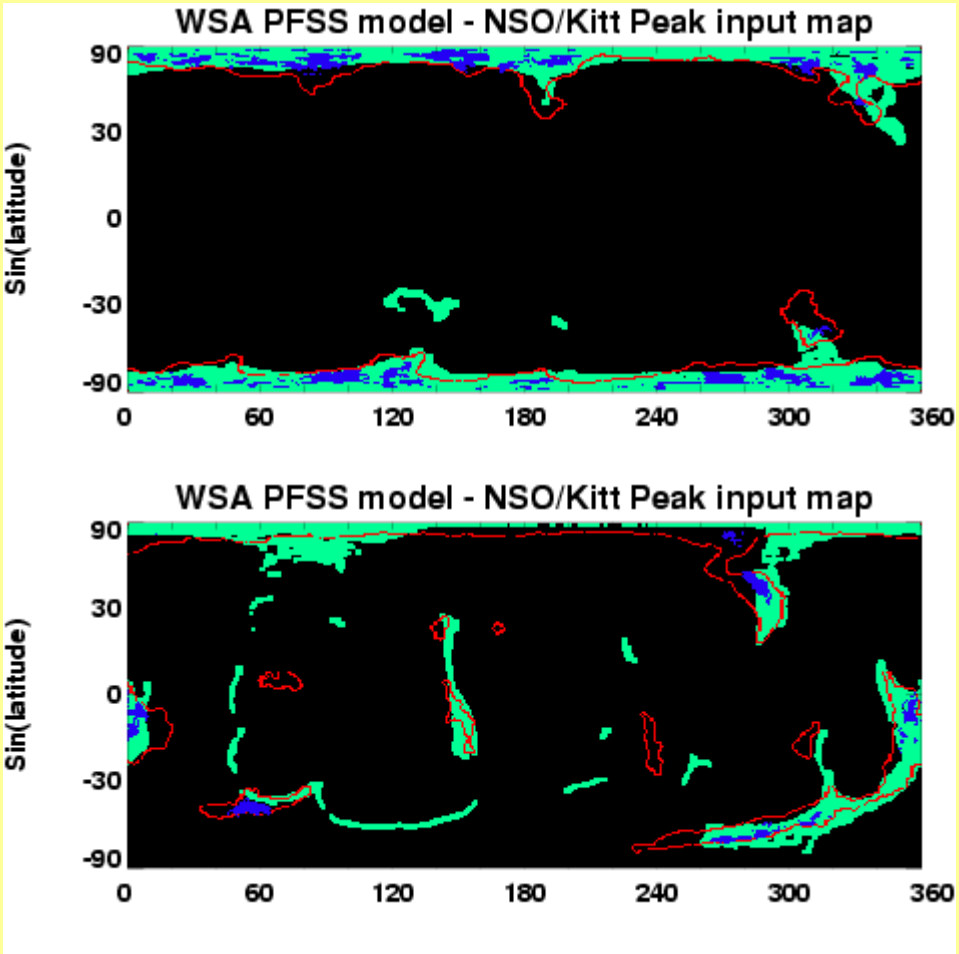
Model Validation and Verification

Example: model convergence for CR 1856



Model Validation and Verification

Example: Coronal Holes



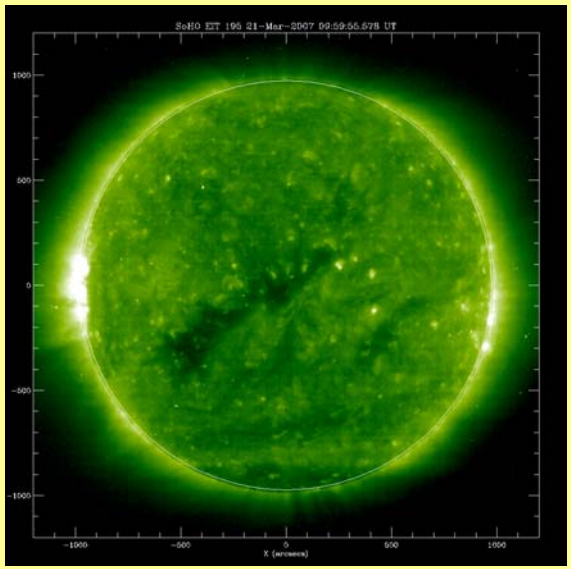
Near Solar Minimum (May 1997): Carrington Rotation 1922

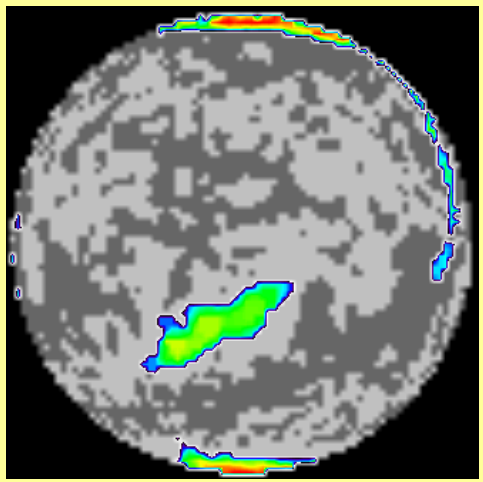
Near Solar Maximum (Feb 2002): Carrington Rotation 1986

Reference: G. DeToma et.al.

Model Validation and Verification

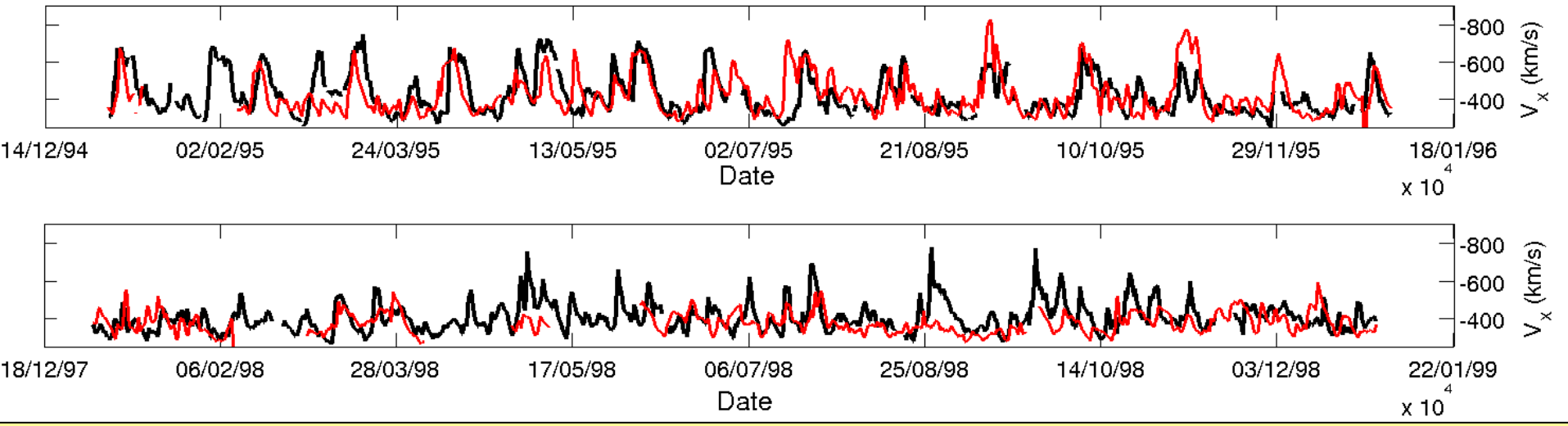
Application: SOHO EIT Image compared to WSA CH Map





Model Validation and Verification

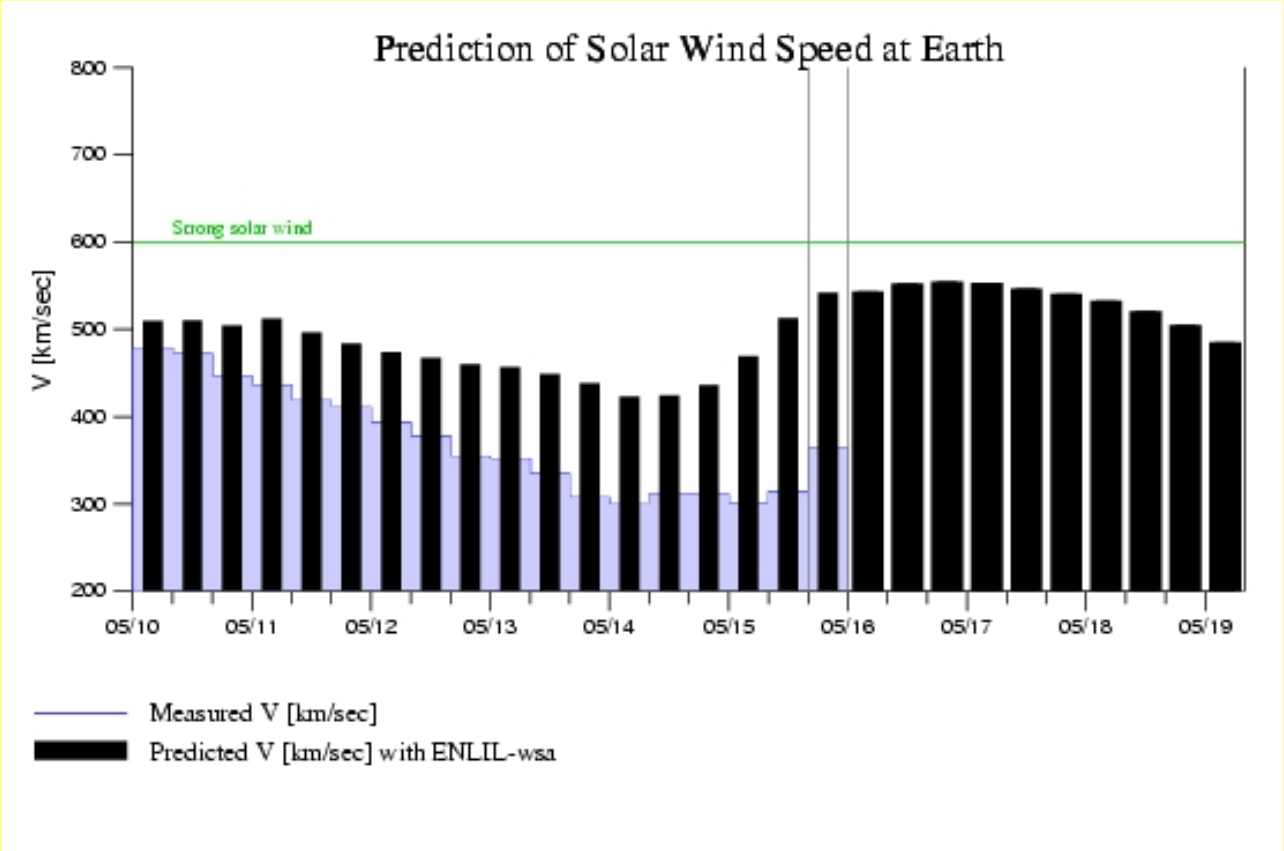
Example: Solar Wind Speed Time Series 1994-2003



Reference: M. Owens et.al.

Model Validation and Verification

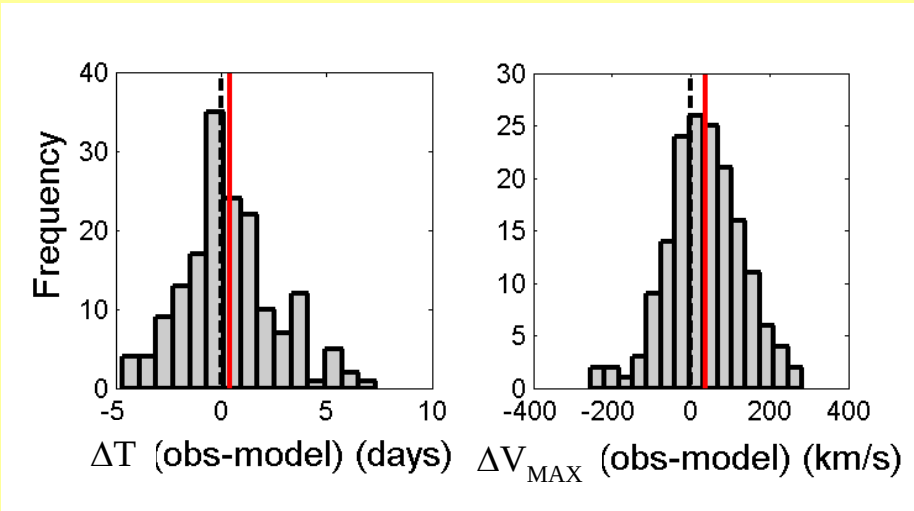
Application: 3 Day Forecast of Solar Wind Speed at L_1



Model Validation and Verification

Example: High Speed Events $\Delta V >= 100$ km/s **for** $\Delta T >= 2$ days

Histograms of event properties

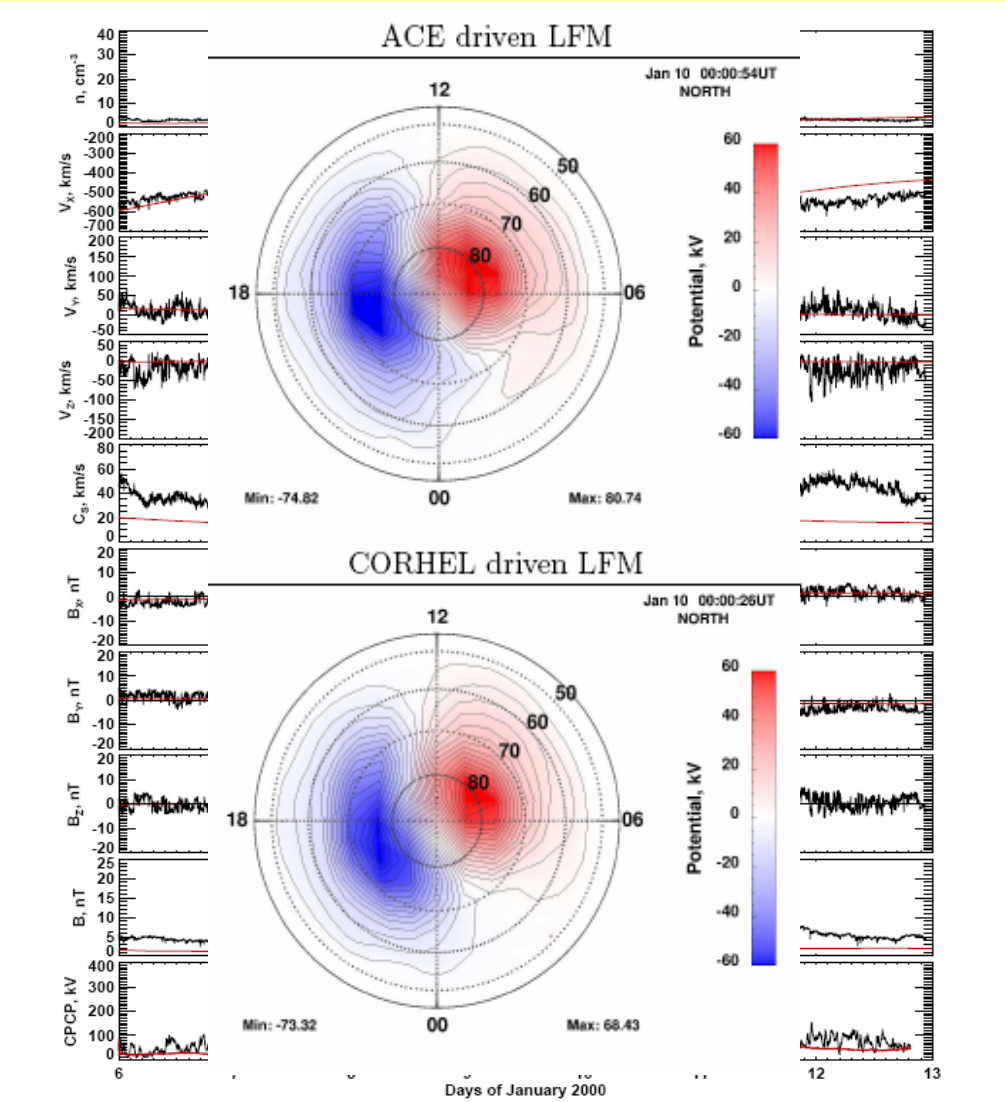


Categorical contingency tables

		Observed	
		HSE	No HSE
Model	HSE	166 (166)	36 (42)
	No HSE	64 (80)	- -

Reference: M. Owens et.al.

Model Validation and Verification

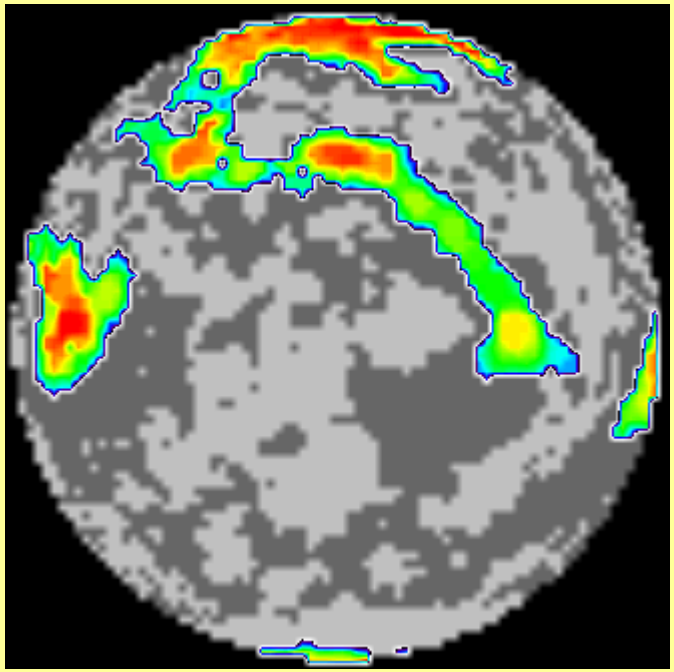


Reference: V. Merkin et.al.

Solar Wind Forecast Products

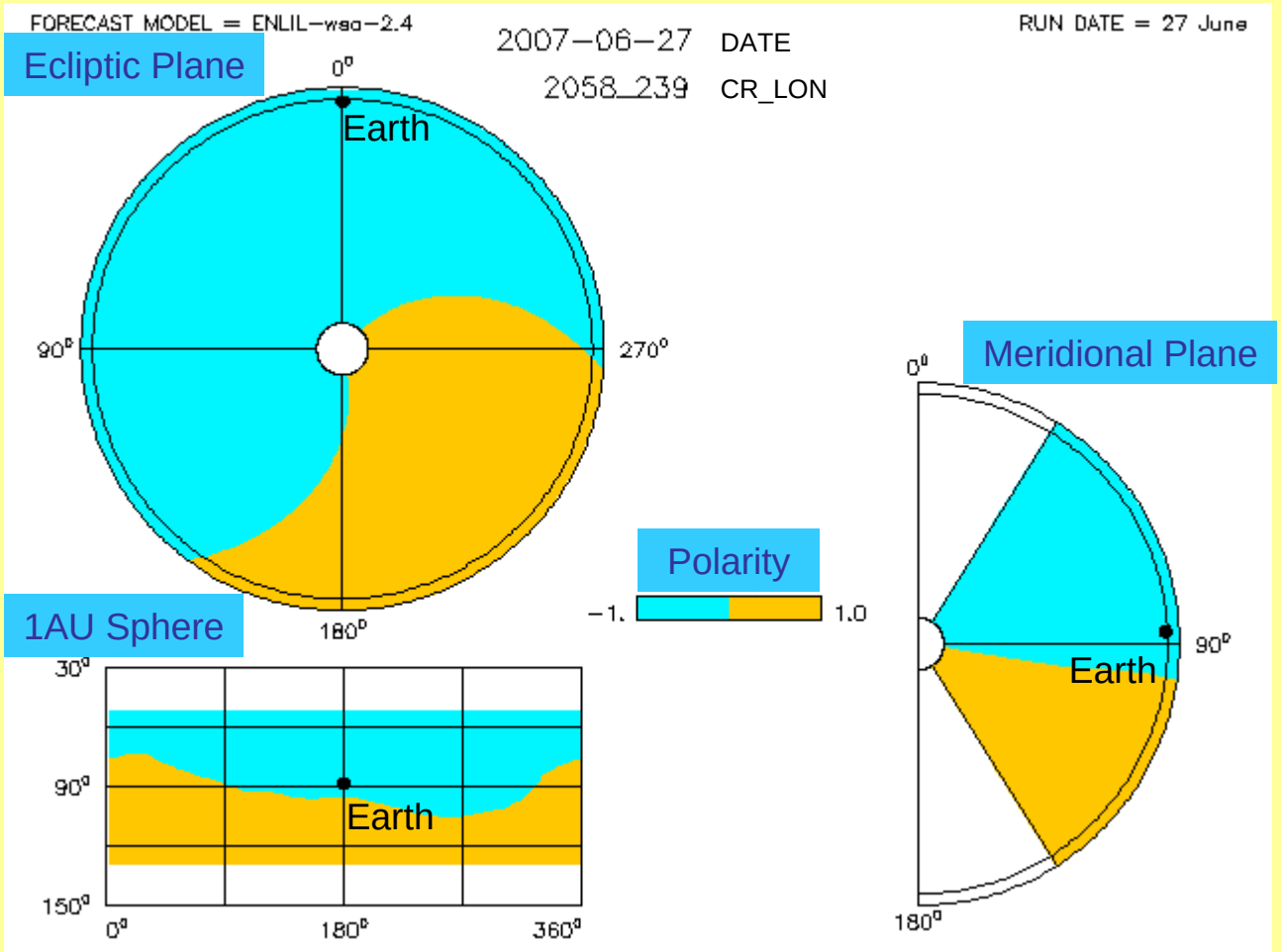
Solar Wind Forecast Products

Coronal Hole Map on June 27



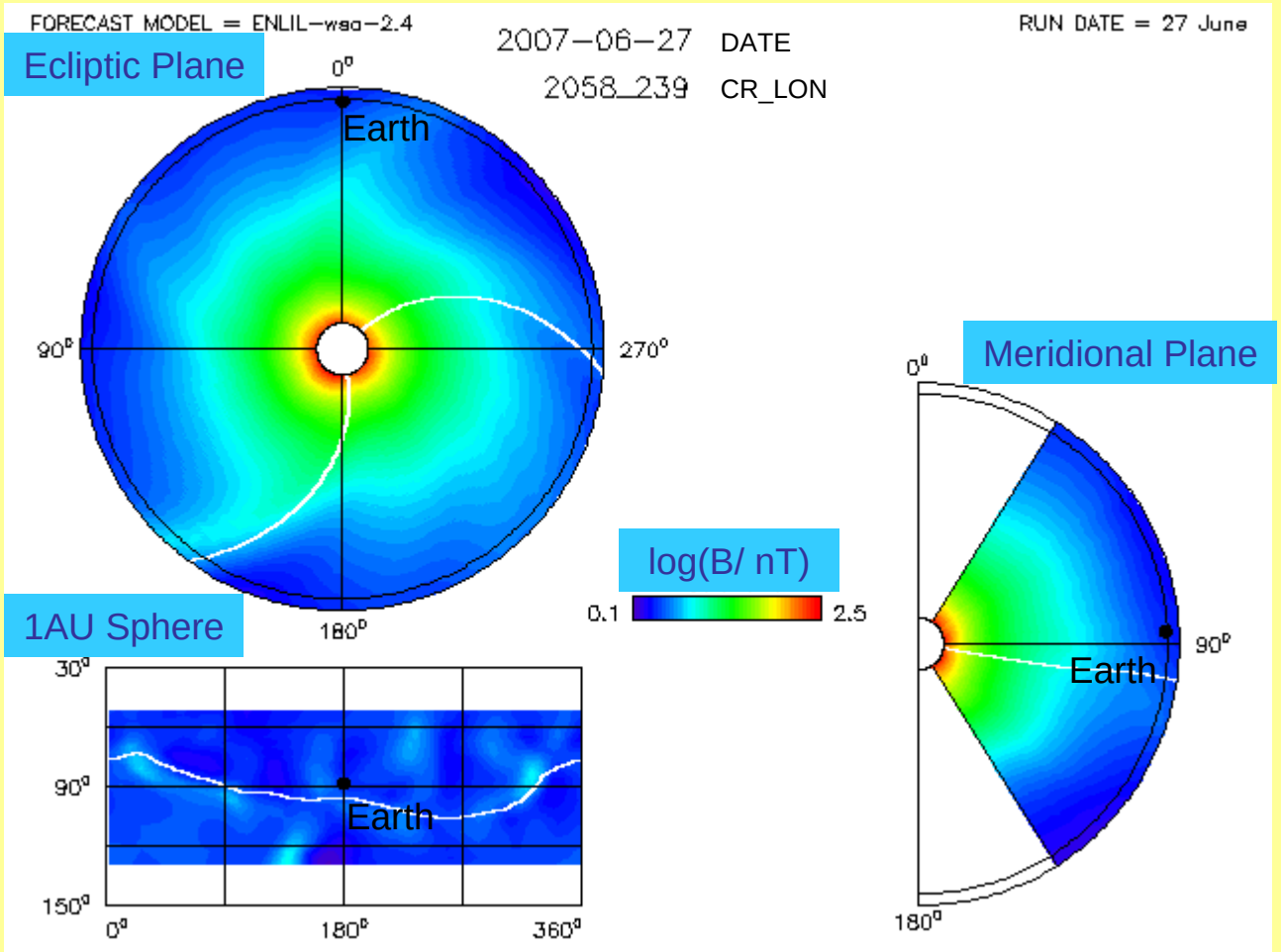
Solar Wind Forecast Products

Solar Wind Polarity on June 27



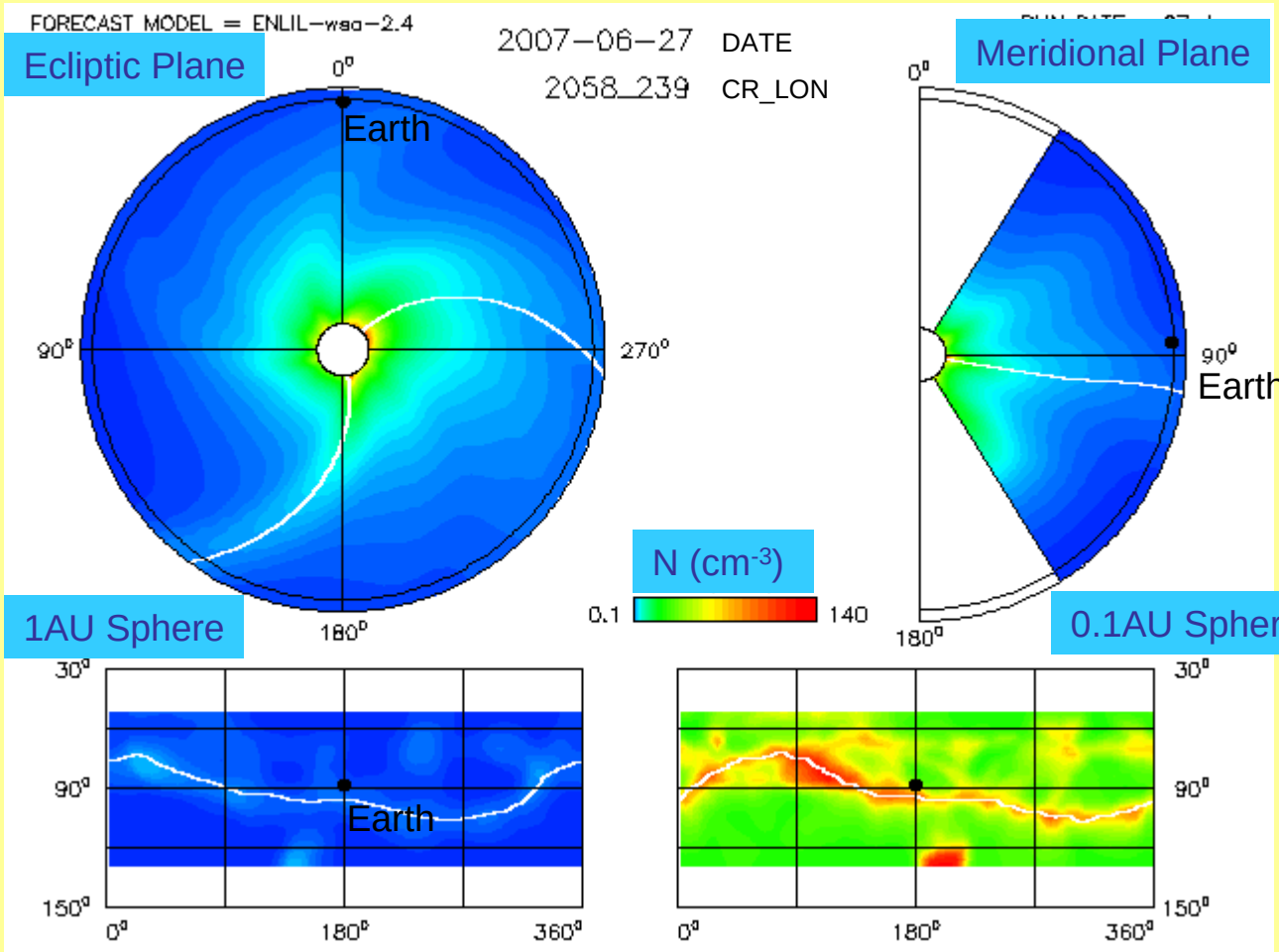
Solar Wind Forecast Products

Solar Wind Field Strength on June 27



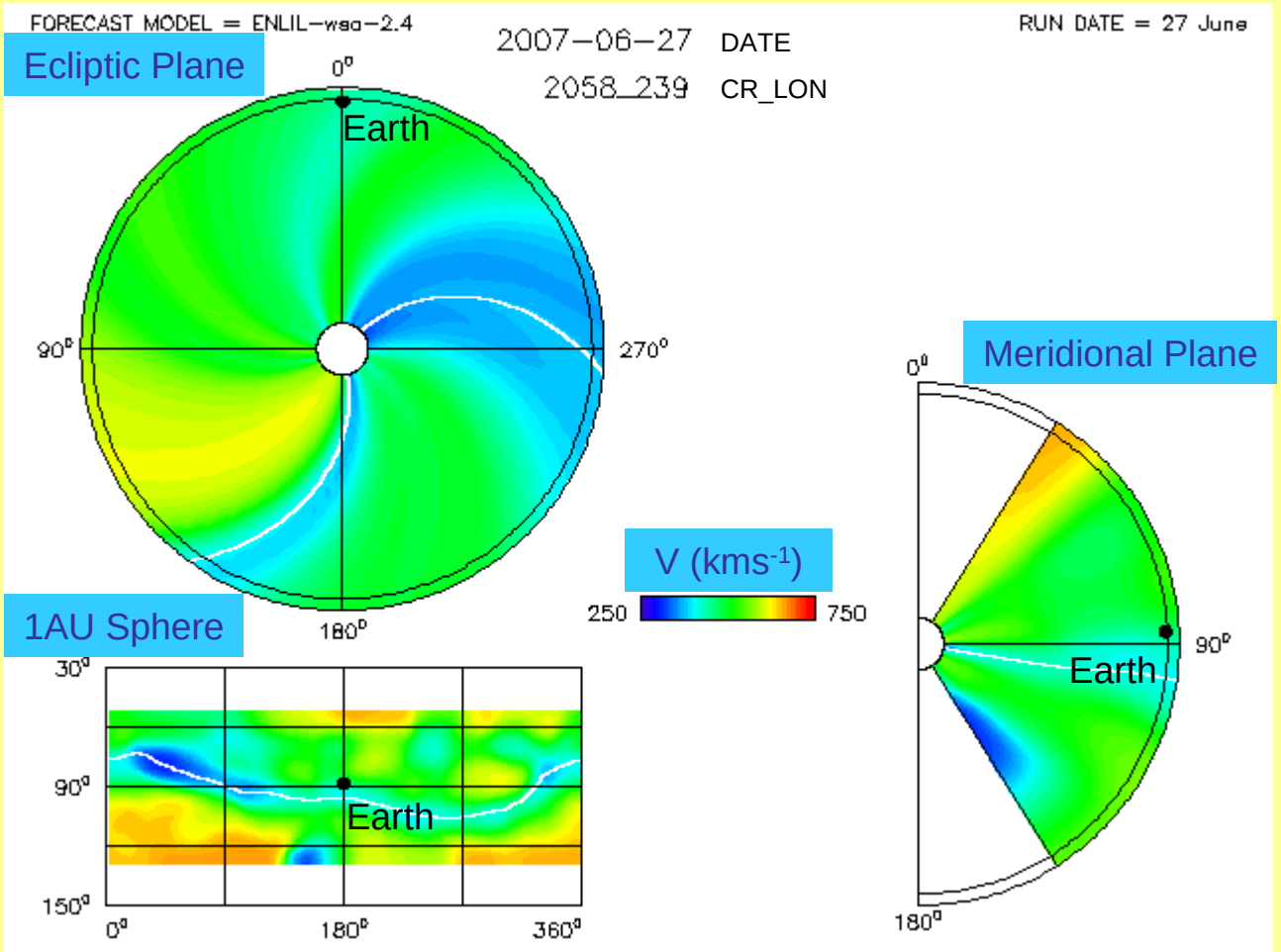
Solar Wind Forecast Products

Solar Wind Density on June 27



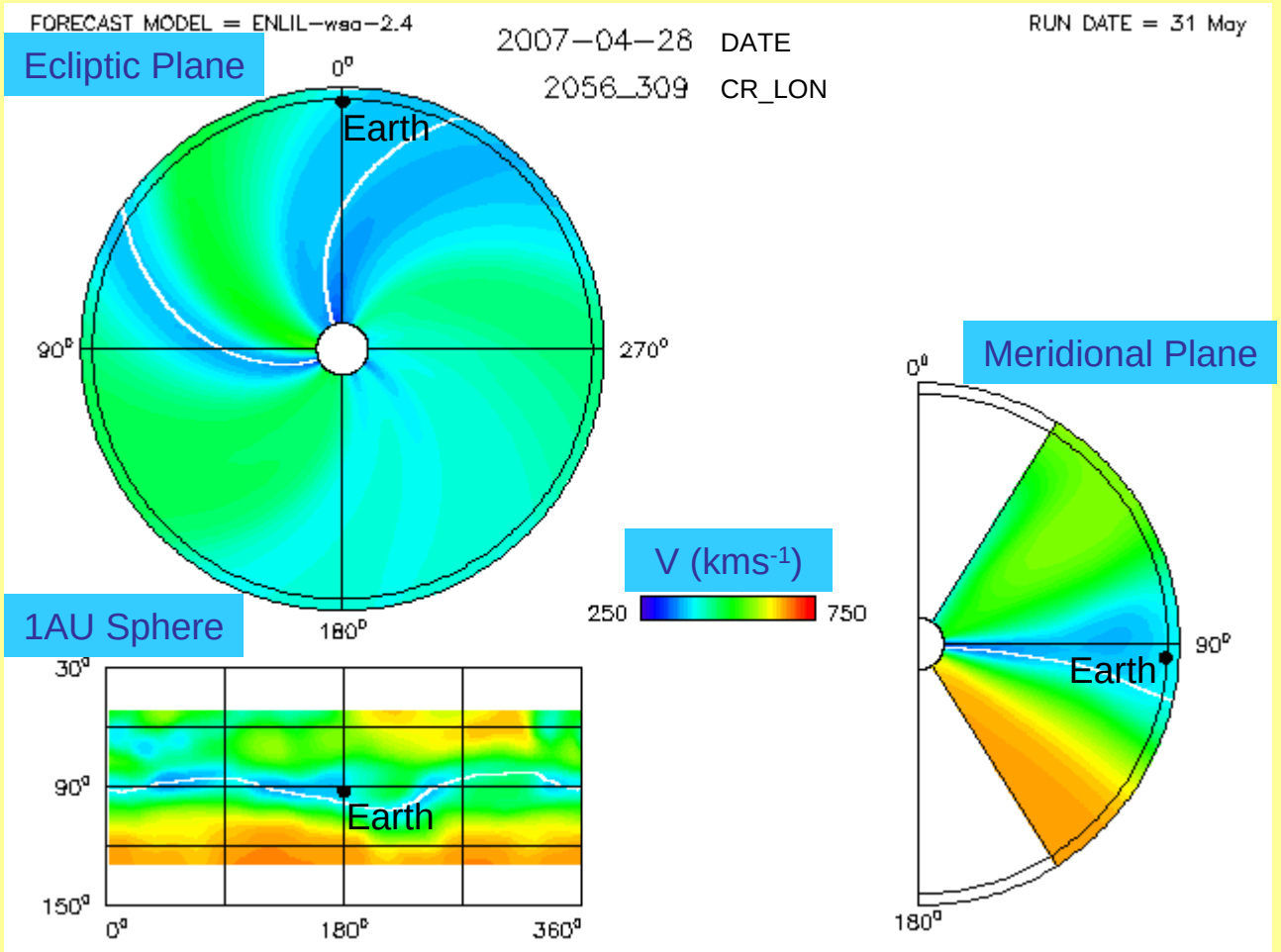
Solar Wind Forecast Products

Solar Wind Speed on June 27



Solar Wind Forecast Products

Solar Wind Speed from April 28 til June 27



STEREO Beacon Support

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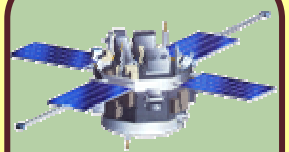
Daily SOLIS synoptic maps



Real-time Solar Wind Data at L_1

Real-time Stereo A & B Data

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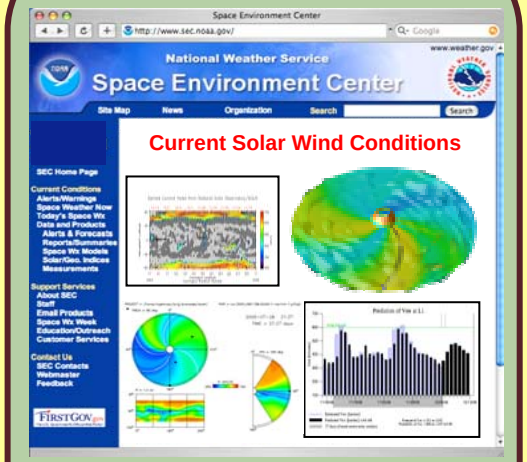
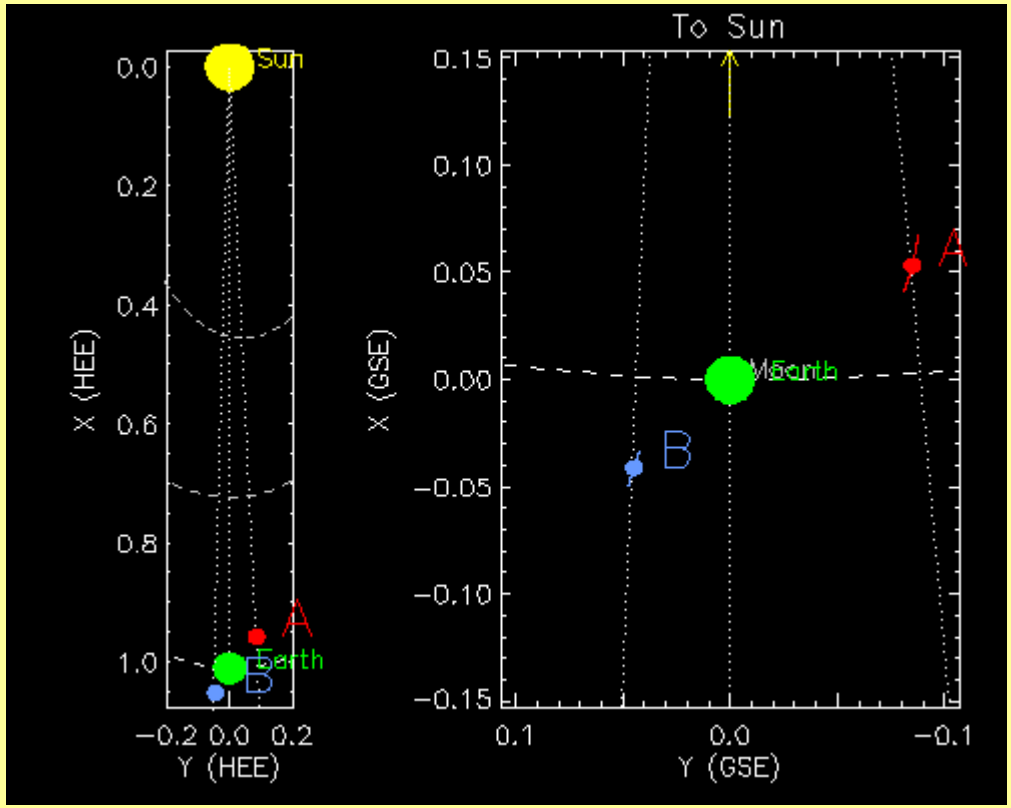


Space Weather Forecast (SEC)

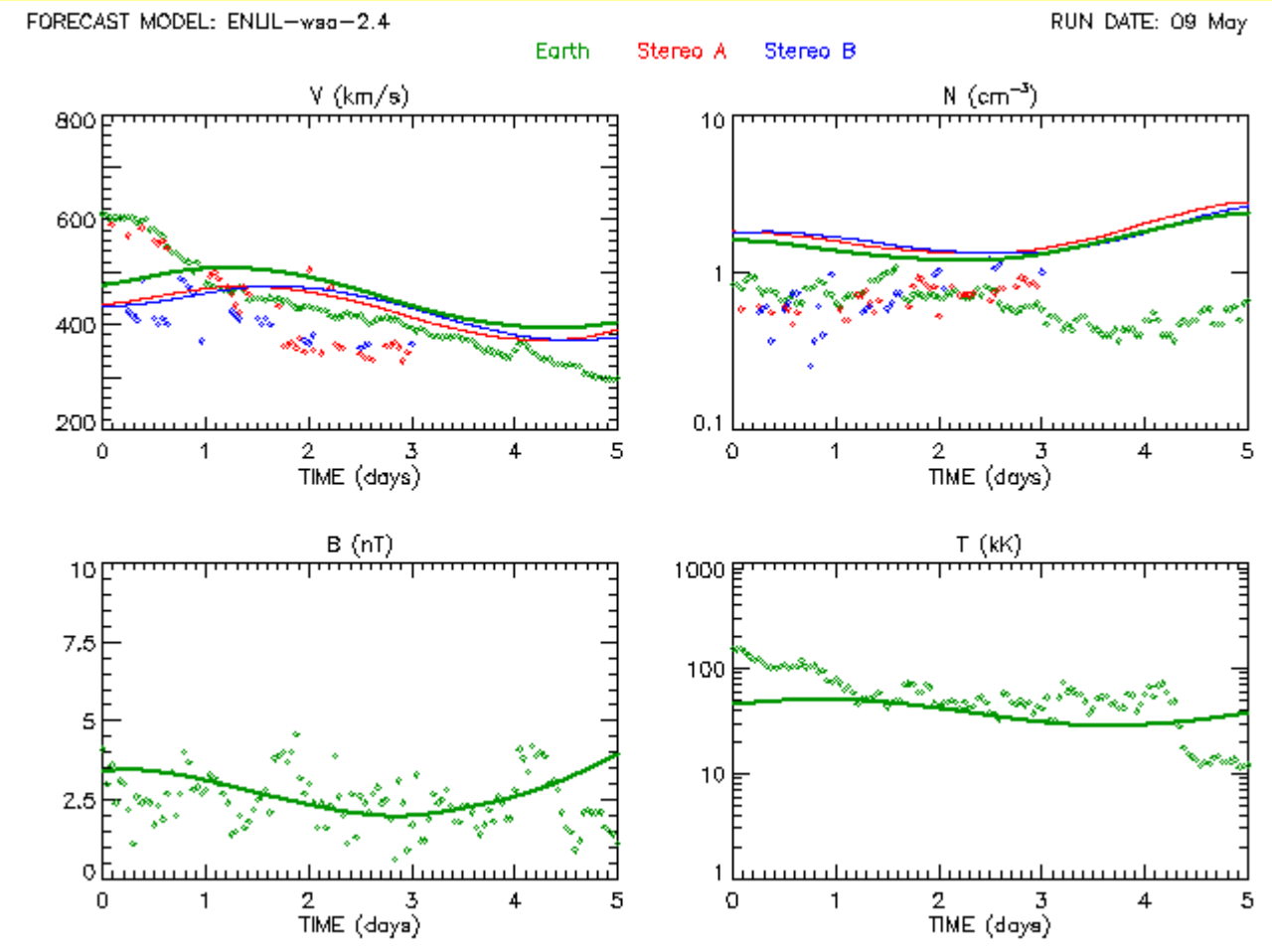
STEREO Beacon Support

Where is Stereo on May 9



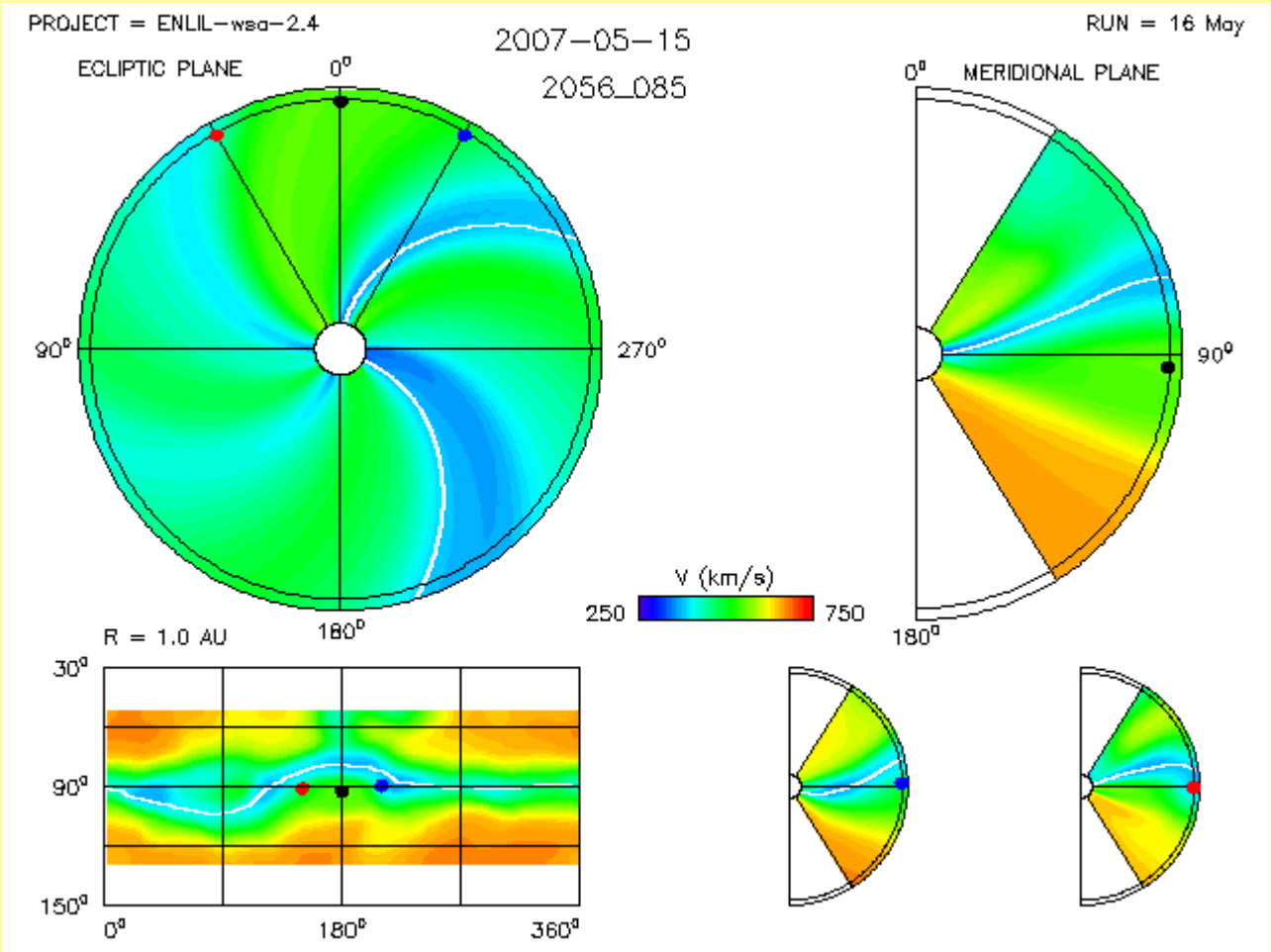
STEREO Beacon Support

5 Day Forecast for Earth L_1, Stereo A, and Stereo B on May 9



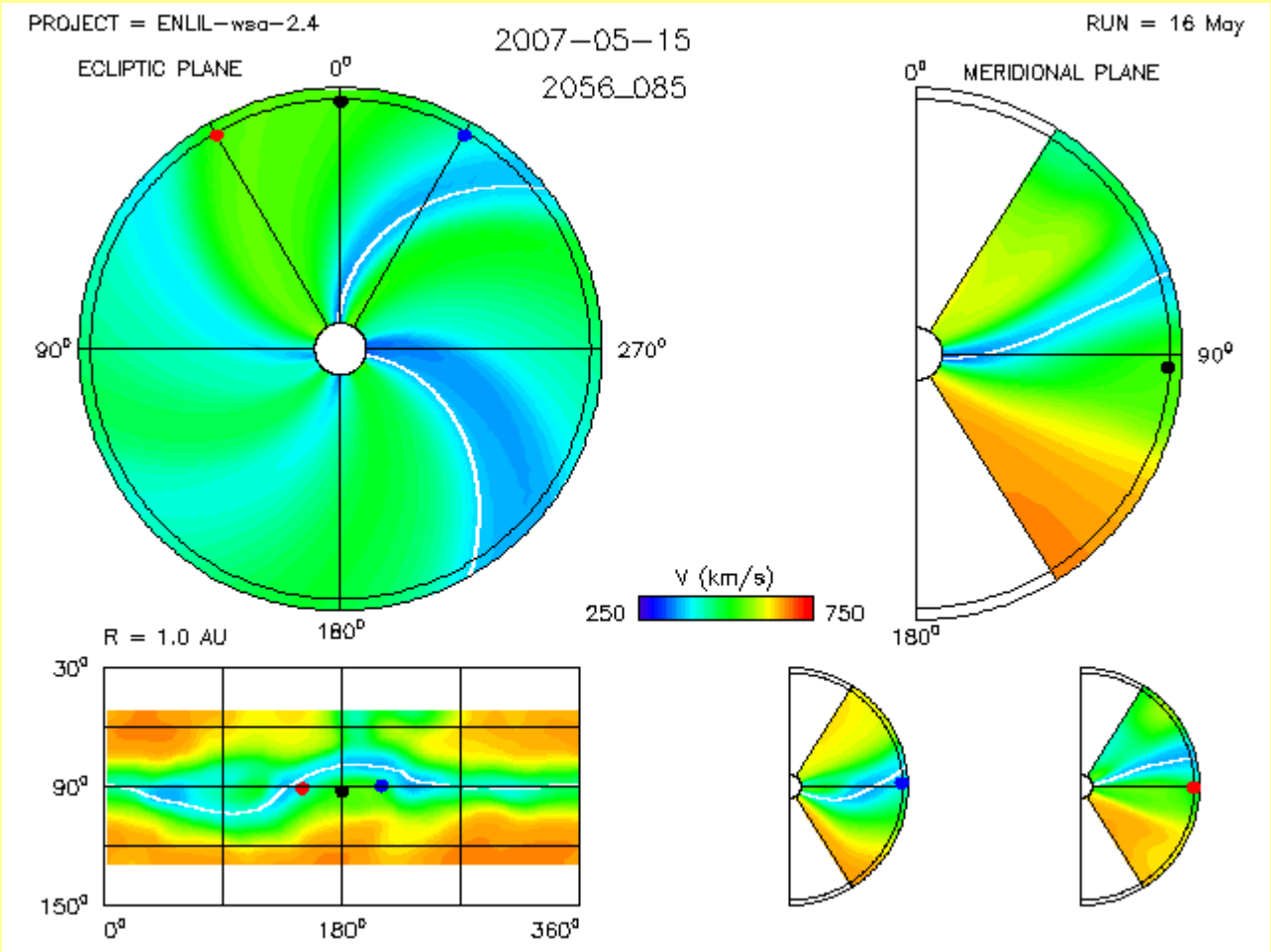
STEREO Beacon Support

Notional Displays for Earth L_1, Stereo A, and Stereo B



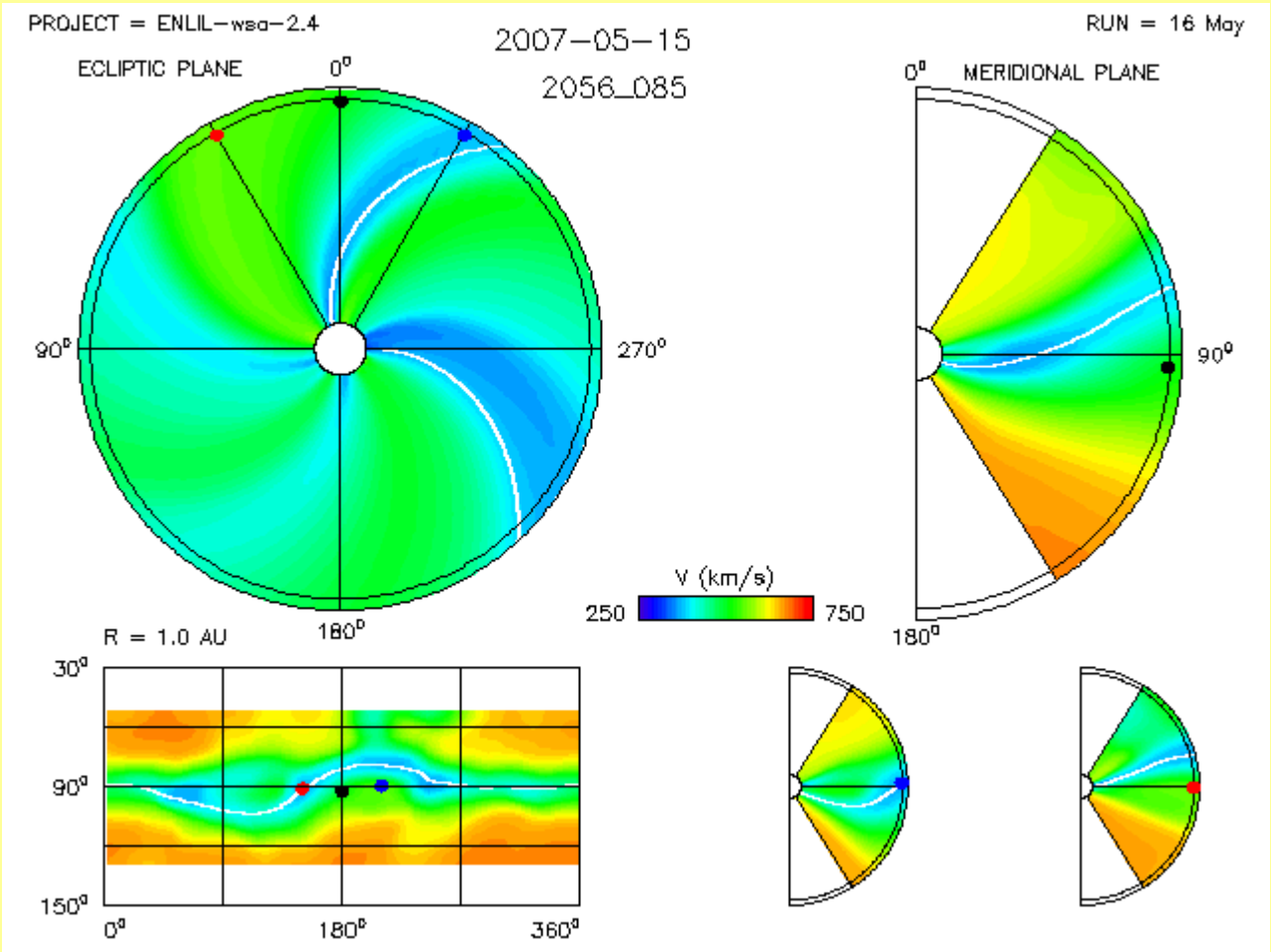
STEREO Beacon Support

Notional Displays for Earth L_1, Stereo A, and Stereo B



STEREO Beacon Support

Notional Displays for Earth L_1, Stereo A, and Stereo B



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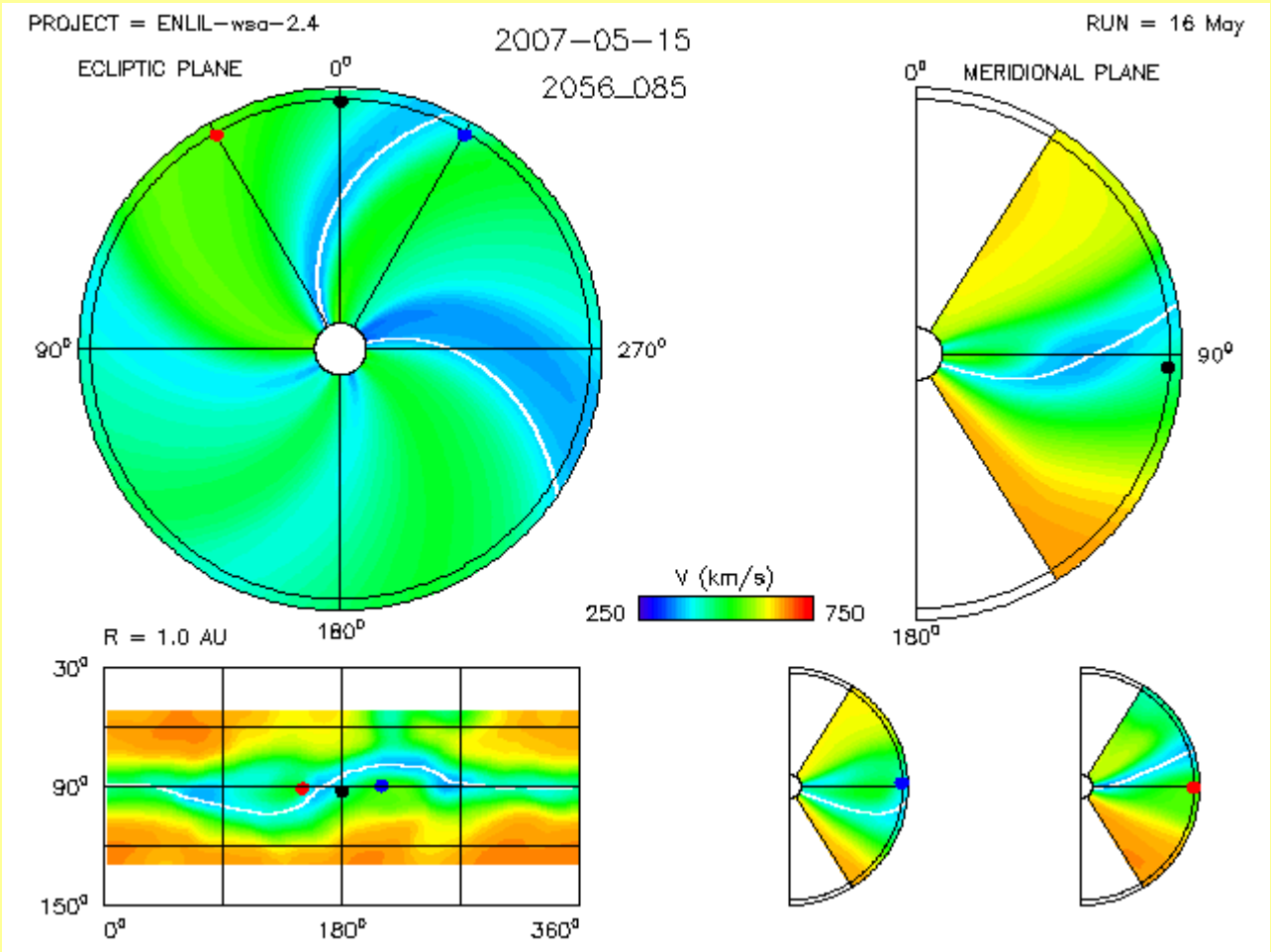

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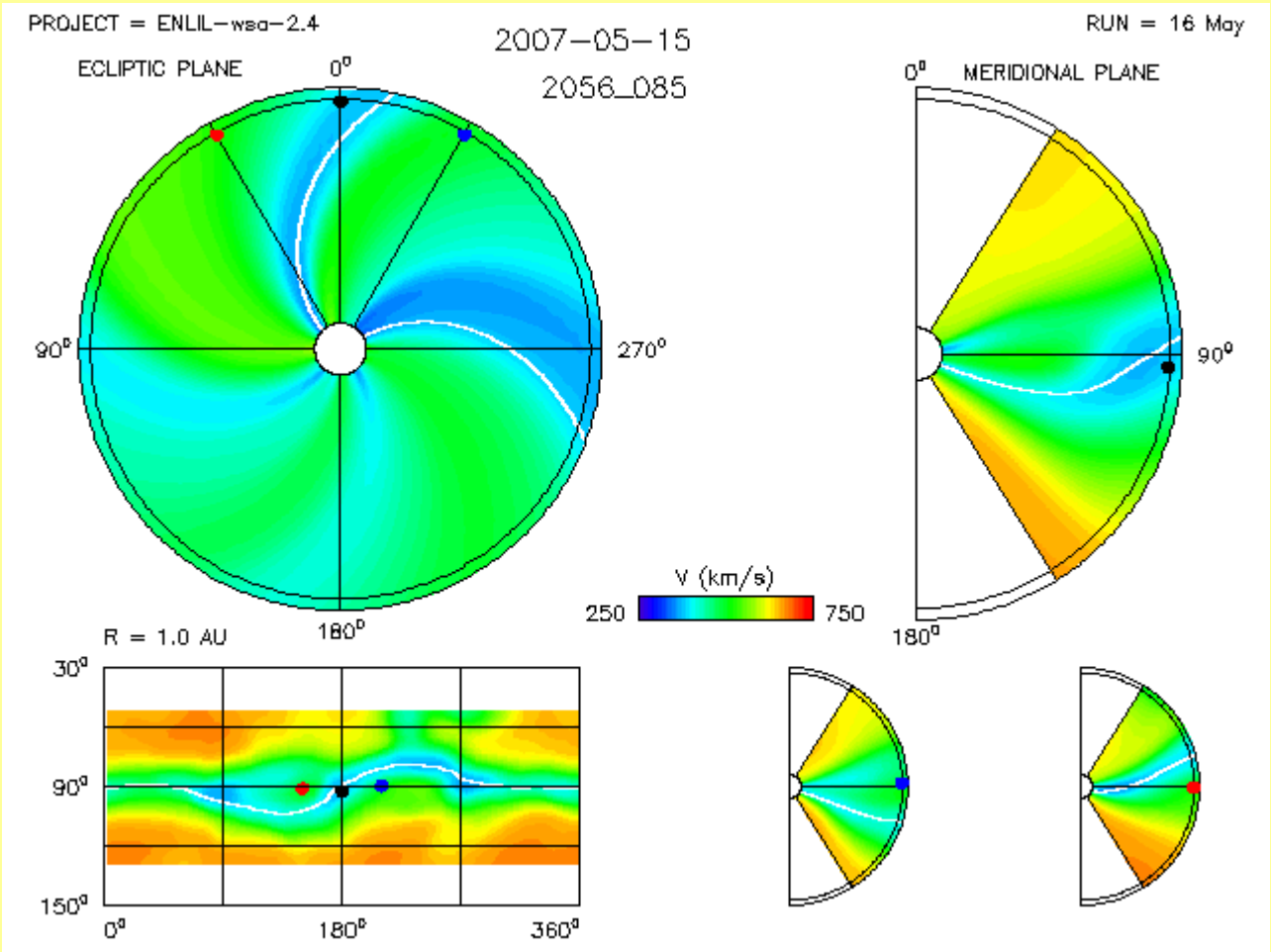

Forecasting the Solar Wind in the Inner Heliosphere

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The Development Team

Thank you!

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