

Data Analysis and Generalizations

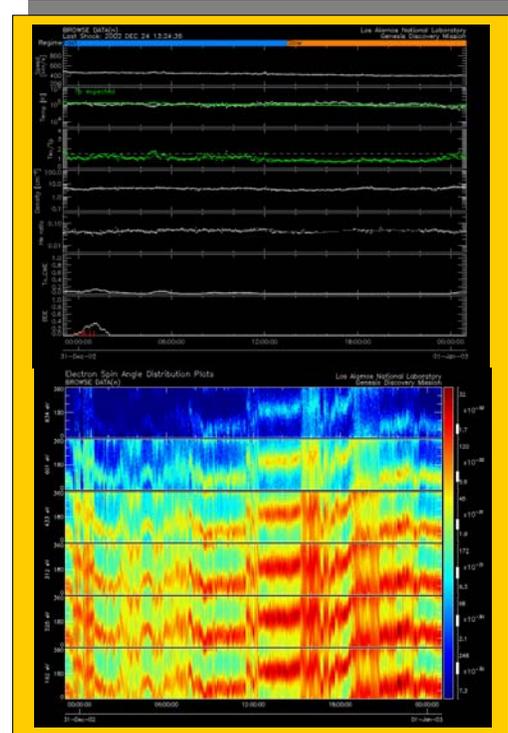
A First Look

STUDENT ACTIVITY

In this activity, you will explore Genesis solar wind data by studying information located on the Los Alamos National Laboratory (LANL) Genesis data Web site. The data summary sheets contain seven panels: Speed, Temperature, Expected Temperature/Measured Temperature, Density, Helium Ratio, Coronal Mass Ejection (CME), and Bi-Directional Electron Indicator (BDE). In this activity, you will be studying the first five panels. After reviewing the data and how they are presented, you will observe and record data patterns, anomalies, or divergences from the predicted values and think about questions that might arise from this study.

PART 1: A Day in the Life of Genesis

- Look at the first day's solar wind summary data plot. Answer the following questions:
 - What is the date of this summary data plot?
 - What times are marked on the x-axis (horizontal)?
 - What regime(s) are shown during this day?
 - What are the units for the following panels:
 - Speed
 - Temperature
 - Density
- Observe the Speed panel. What is the solar wind speed for the following times?
 - 00:00:00
 - 06:00:00
 - 12:00:00
 - 18:00:00
 - 00:00:00 (next day)
- Describe the trend in the speed during this day. Is the speed increasing, decreasing, or staying about the same?



Top: Solar Wind Data Plot
Bottom: Electron Spin Distribution Plot

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4. Classify your answers in questions 2 and 3 as qualitative or quantitative data.

5. Describe the benefits and limitations of each type of data.

6. In the Temperature panel, there are three data sets. When viewing these data summaries on a computer or color printout, white points represent the measured temperature readings; the green points represent the expected temperatures; and the white dots represent the average of the measured temperature readings. When reading a black and white printout, the larger dots are the white points (measured temperature readings); the smaller dots are the green points (expected temperatures), and the white dots may not be distinguishable. What is the measured temperature reading for each of the following times?
 - a) 00:00:00
 - b) 06:00:00
 - c) 12:00:00
 - d) 18:00:00
 - e) 00:00:00 (next day)

7. Describe the trend in the temperatures during this day. Is the temperature increasing, decreasing, or staying about the same?

8. How do measured temperatures compare with the expected temperatures on this day?

9. Observe the Density panel. The white points represent the proton (hydrogen nucleus) density. The white, dotted line represents the running average proton density, which may not be distinguishable on black and white printouts. What the proton density for each of the following times?
 - a) 00:00:00
 - b) 06:00:00
 - c) 12:00:00
 - d) 18:00:00
 - e) 00:00:00 (next day)

10. Describe the trend in the proton density during this day. Is the proton density increasing, decreasing, or staying about the same?

11. Observe the He ratio panel. The white points show the ratio of alpha particle (helium nucleus) number density to the proton number density. The white, dotted line shows the running average of alpha/proton ratio, which may not be distinguishable on black and white printouts. Find the highest ratio number on this day. Find the lowest ratio number on this day. At which of these two points is the ratio of helium nuclei to hydrogen nuclei higher?

Part 2: Changes in Solar Wind Regimes

Answer the following questions using a minimum of one week of solar wind data summaries:

1. Indicate the date and time of each change in solar wind regime and record the type of change.

Date	Time	Regime changes from:	Regime changes to:



2. Note the effects for each type of regime change. Identify any patterns or anomalies in the changes.

Type of Regime Change	Effect of Change on Speed	Effect of Change on Temperature		
CME to Slow				
CME to Fast				
Slow to CME				
Slow to Fast				
Fast to Slow				
Fast to CME				

3. As a group, list inferences and questions that come to mind as you observe the effects of the solar wind regime changes over this week.

4. What other questions come to mind as you observe data patterns and anomalies?