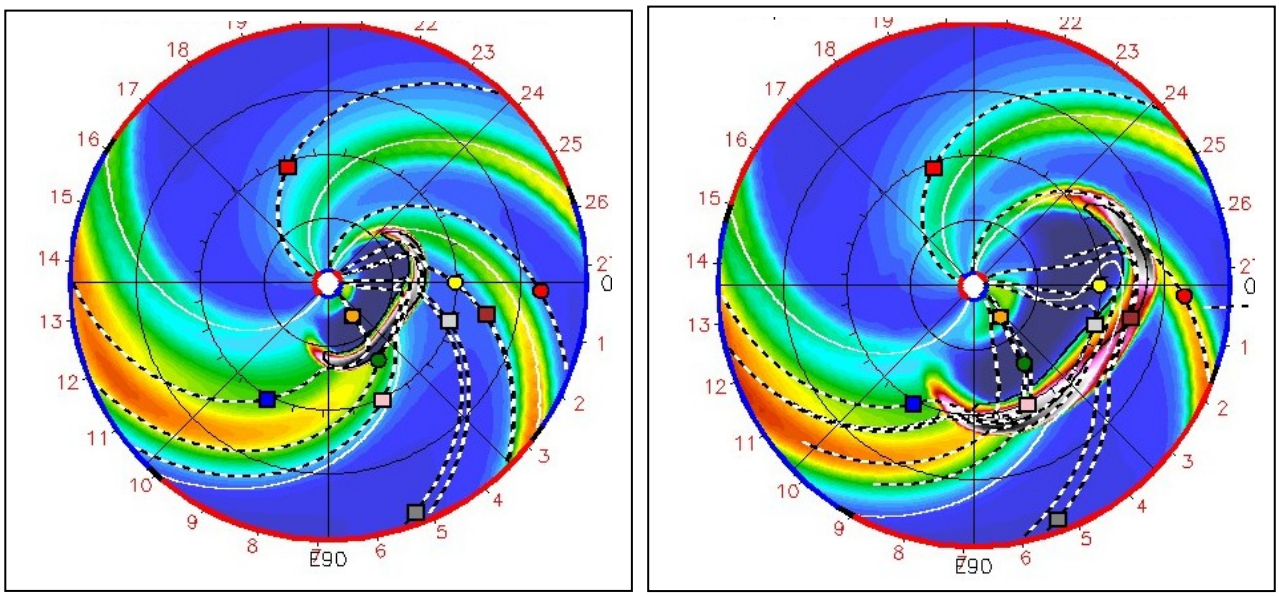


This pair of computed images shows the spiral pattern of the solar wind inside the orbit of Mars. It was created by the NASA Goddard, Coordinated Community Modeling Center to show the condition of the solar wind just after the March 6, 2012 solar storm. The images correspond to March 8 (00:00) and March 9 (00:00).

The planets are indicated at their correct positions by circles (yellow=Earth; red=Mars; orange=Mercury and green=Venus). Also shown are the positions of the STEREO A and B spacecraft (red and blue squares) and the Spitzer Space Telescope (pink square). The black concentric circles are drawn at intervals of 75 million kilometers.

The pinwheel pattern is formed from the high-speed gas streams leaving the sun through coronal holes. The crescent shaped cloud is the coronal mass ejection (CME) from the sun, which caused brilliant aurora on Earth.

**Problem 1** - About what was the speed, in km/h, of the CME when it reached Earth?

**Problem 2** - The dark cavity behind the CME represents a very low density region of space. How do you think this was created? Where did the gas go that once filled the cavity?

**Problem 3** - At the orbit of Earth, about how fast do the high-speed gas streams sweep past the Earth in kilometers/hour?

**Problem 4** - Assuming that the CME does not slow down, on what date will it arrive at Neptune, which is located 4.5 billion kilometers from the sun?

**Problem 1** - About what was the speed, in km/h, of the CME when it reached Earth?

Answer: Students can estimate from the scaled figures that between the two days the crescent-shaped CME moves about one division or 75 million kilometers. This took 1 day or 24 hours, so the speed was 75 million km/24 h = **about 3 million km/h**.

**Problem 2** - The dark cavity behind the CME represents a very low density region of space. How do you think this was created? Where did the gas go that once filled the cavity?

Answer: **The CME traveled through the gas and swept it up like a snow-plow in front of the CME.**

**Problem 3** - At the orbit of Earth, about how fast do the high-speed gas streams sweep past the Earth in kilometers/hour?

Answer: It will be a challenge to find a feature in the spiral gas streams that can be tracked between the two days, but a reasonable answer would be that the pattern rotated by about 25 million km in 1 day, so the speed is about **1 million km/h**.

**Problem 4** - Assuming that the CME does not slow down, on what date will it arrive at Neptune, which is located 4.5 billion kilometers from the sun?

**Answer:** The CME travels about 3 million km/h so it traveled about 4500 million km during the transit time, so T = 4500/3 = 1500 hours which equals 62.5 days. When this is added to the launch date of March 6 in the first frame, we get a date of about **May 7.**