

Did Voyager I Cross the Solar-Wind Termination Shock?

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A major goal of solar-system exploration is the in situ observation of the termination shock of the solar wind, which is expected to be at around 90-120 AU from the center of the Sun. The 2 Voyager spacecraft are now poised to carry out this observation. They are expected to see both a strong termination shock and evidence of copious acceleration of energetic charged particles and anomalous cosmic rays. Voyager I is the furthest from the Sun, currently at about 88 AU, and hence should be the first to see the phenomena.

It may have already been seen. For several months in the second half of 2002, Voyager I observed very strange increased fluxes of energetic particles which had the composition of anomalous cosmic rays, high anisotropies and other interesting features.

One of the Voyager cosmic-ray experimental teams claims that these are the signatures of a transient inward motion of the termination shock which moved inward, crossed Voyager I and several months later moved back out. The other Voyager cosmic-ray group claims that this is not the proper interpretation and has put forth a different interpretation. The plasma instrument on Voyager I, which would provide the definitive observations, is not operating. However, the magnetic field instrument is working and seems to rule out the claimed shock crossing.

These puzzling data will be discussed and possible theoretical scenarios which can explain them will be discussed. The most likely scenarios suggest that in late 2002 Voyager I was, at the very least, quite near the termination shock.