

Characteristics of the Solar Wind Termination Shock Region from Voyager 1 Observations

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The Voyager 1 spacecraft crossed the solar wind termination shock on 16 December 2004 at a distance of 94.0 AU from the Sun and at a heliolatitude of 34 N. Up to that time, since mid-2002, Voyager 1 had been on interplanetary magnetic field lines intermittently connected to a source of low-energy particles at the termination shock. The energy spectra after the crossing, and often prior to the crossing as well, resemble the energy spectra expected for anomalous cosmic rays (ACRs) at the shock, with one important difference. Although the spectra have a power-law dependence at low energies and a roll off to a much steeper power-law spectrum at higher energies, similar to that expected for the ACR spectrum at the shock, the energy of the roll off is much lower than observed in the ACR spectrum at the same time. Hence, the ACRs must be originating from a different part of the shock. We find that the roll-off energy for protons is about 3 MeV, rather than ~ 100 MeV expected for ACR protons. The power-law spectral index at low energies is approximately -1.5 , implying a shock strength of ~ 2.5 .

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