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Niagara Falls Cascade Model for Interstellar Ions in the Heliosheath

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Abstract content

The origin of anomalous cosmic ray ions has long been assumed to be heliospheric pickup ion production from interstellar neutrals and acceleration at the solar wind termination shock. The Voyager-1 shock crossing showed a well-defined boundary for sharply increased keV ion fluxes in the heliosheath but no sign of local acceleration. Ion flux spectra at keV to MeV energies are instead unfolding with outward passage to approximate the E(-1.5) power-law expected for compressional magnetic tubulence. This spectrum provides excellent connection over many energy decades of a maxwellian distribution for local interstellar plasma ions to well-known flux spectra of high energy galactic ions at GeV energies. The Niagara Falls cascade model is proposed that the heliosheath is a transitional region for direct entry of ions from the local interstellar 'river' through a permeable heliopause into the supersonic outer heliosphere. As Voyager-1 moves outwards in the heliosheath to the heliopause, energy-dependent transport features can appear in the transitional 0.01 – 1 GeV/n energy band but otherwise a general unfolding to the interstellar limiting spectrum should continue by this model. Spectral regions then become dominated by bulk plasma flow at low energy, cascade transport at intermediate energies, and interstellar shock acceleration at higher energies.

If this papers is presented for a collaboration, please specify the collaboration

Summary

Reference

Proceedings of the 30th International Cosmic Ray Conference; Rogelio Caballero, Juan Carlos D'Olivo, Gustavo Medina-Tanco, Lukas Nellen, Federico A. Sánchez, José F. Valdés-Galicia (eds.); Universidad Nacional Autónoma de México, Mexico City, Mexico, 2008; Vol. 1 (SH), pages 861-864

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