ABSTRACTS

11.09 X-Ray and UV Observations of the Rapidly Rotating Triple System HD 165590, R. A. STERN, Jet Propulsion Laboratory, California Institute of Technology, and A. SKUMANICH, High Altitude Observatory, NCAR.

Assuming the quadratic dependence of coronal x-ray luminosity on stellar rotational velocity suggested by Skumanich, Stern et al. and Pallavicini et al., we predicted a substantially soft x-ray flux for the triple system HD 165590 (vis. bin. + spec. bin.; v sin i (S.B.) = 75 km s⁻¹), several x 10⁻³ erg s⁻¹. Recent Einstein IPC observations have confirmed these predictions, yielding a derived Lₓ = 10⁻¹²⁺⁻¹⁴ erg s⁻¹. Transition region lines of CIV, Si IV and NV have also been observed, consistent with the coronal interpretation. We discuss the importance of these results for theories of stellar activity based upon dynamo action.

This work was performed at the Jet Propulsion Laboratory, California Institute of Technology under NASA contract NAS 7-100.

11.10 Time-Dependent Solar Wind Ionization, S.P. OWOCKI, HAO and JAO, and J.J. HUNDHAUSEN, HAO.

The solar wind ionization state is "frozen" within a few solar radii of the photosphere, and measurements of the ions at 1 a.u. can therefore potentially yield information about conditions at the base of the coronal expansion. In the active solar corona, intrinsic time variations (e.g. coronal transients) are often as important as variations associated with flow through spatial gradients in determining the frozen-in ionization state. We illustrate that, by using a Lagrangian approach of following individual fluid parcels, the techniques used for calculating ionization state variations in a steady-state case can be straightforwardly extended to time-varying flows.

The specific time-dependent ionization calculations presented here are for a relatively simple parameterization based on a self-similar, strong-shock picture of the flow, but the technique we use is applicable to all uniform ion flows with known time and spatial variations in density, velocity and temperature. Calculations using this parameterization show that only fluid parcels shocked at or below the ambient freezing-in radius have their ionization state modified by the shock. In parcels shocked within this radius, the degree of ionization is initially increased sharply by heating at the shock, but then declines because of adiabatic cooling with the outward expansion; the asymptotic degree of ionization for such parcels can actually be lower than for the unshocked ambient flow. Parcels shocked near the freezing-in radius show less of an initial response to the heating, but they are already frozen-in during the cooling phase and thus have a moderately enhanced asymptotic degree of ionization provided that the analysis is carried out in a system moving with the solar wind. The approximate transport equations that apply in this system are very similar to those that apply in the absence of convection. With the aid of the Lorentz transformation, these equations can be expressed in terms of the spatial and temporal co-ordinates of the fixed system.

In the diffusive regime, this formulation reduces to Parker's well known equation for cosmic-ray modulation, but the new equations are more general, for they describe the coherent modes of transport that appear when the mean free path is large compared to 1 AU, and they retain their validity for arbitrary solar wind velocity. The latter characteristic opens up new possibilities for analyzing particle transport in the relativistic flows seen in some astronomical objects. This research was supported by the National Aeronautics and Space Administration under grant NGR 21-002-066.


We have recently reported observations showing that EUV lines formed in the transition region and corona are systematically shifted to shorter wavelengths within low latitude coronal holes. These shifts correspond to systematic outflow velocities relative to non-hole regions, of 3-7 km s⁻¹ in the transition region and 15 km s⁻¹ at the base of the inner corona. These observations were obtained in two flights of a stable, high resolution rocket-borne EUV spectrometer built at the Laboratory for Atmospheric and Space Physics. These outflows are of special interest because they suggest that the acceleration of the high speed solar wind flow (believed to originate in coronal holes) may occur very low in the solar atmosphere. In order to infer the true mass flux associated with these apparent outflows, absolute measurements of velocity are required. In this paper we will present new measurements in the UV S I II lines formed in the upper chromosphere. These show that if the outflow in holes seen in the transition region and corona also occurs in the chromosphere where S I II is formed, its velocity is less than 1 km s⁻¹. The experimental uncertainties in determining absolute velocities will be discussed. A third flight of this experiment is scheduled for 19 November 1981 and will include an inflight wavelength calibration for absolute velocity determination.

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12.01 On Strong and Weak Strategies Against Astrology, J. D. MULHOLLAND, Univ. Texas Austin. The usual approach to presenting the scientific view of astrology is too often based on purely theoretical persuasion (e.g. T. S. Smith, B.A.S. 12, 850, 1980) and too often involves scientific errors (e.g. Culver & Ianna,