
Nonthermal Broadening of UV lines Observed at the Limb of the Quiet Sun

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We have made a spectroscopic study of the solar transition region using high resolution UV & EUV spectra obtained by SUMER(Solar Ultraviolet Measurements of Emitted Radiation) on board SOHO(Solar and Heliospheric Observatory). The slit was placed along the entire north and south polar regions to examine center-to-limb as well as off-limb variations of physical parameters of various UV lines. Optically thin and conspicuous emission lines have been carefully selected to deduce average quantities representing for the quiet region.

Some important findings emerging from the present work are as follows. 1) Nonthermal velocities estimated from various UV lines do not decrease with height at least within one total line intensity scale height above the limb. 2) Nonthermal velocity distribution with temperature is very similar to that of the disk center, in the sense that it is peaked around $2 \times 10^5 K$, but the peak value is systematically larger than that of the disk. 3) It is found that nonthermal velocity is inversely proportional to quadratic root of electron density up to about 10 arcsec above the limb, namely $\xi \sim N_e^{-1/4}$, which implies that the observed nonthermal line broadening can be attributed to Alfvén waves passing through the medium. 4) Electron density estimated from O V 629/760 line pairs is found to range from about $1 \times 10^{10} cm^{-3}$ to $2 \times 10^{12} cm^{-3}$ in the transition region.