SUMER OBSERVATIONS DETECTING DOWNWARD PROPAGATING WAVES IN THE SOLAR TRANSITION REGION

O. Wikstøl¹, P. G. Judge², V. Hansteen¹,
K. Wilhelm³, U. Schühle³, T. Moran⁴

¹Institute of Theoretical Astrophysics, University of Oslo, P. O. Box 1029 Blindern, 0315 Oslo, Norway
²National Center for Atmospheric Research P.O. Box 3000, Boulder CO 80307-3000, USA
³Max-Planck-Institut für Aeronomie, D-37189 Katlenburg-Lindau, Germany
⁴NASA-Goddard Space Flight Center, Greenbelt MD 20771, USA

ABSTRACT

In an earlier paper (Wikstøl et al. 1997) we proposed a method to detect compressive waves propagating through the transition region. Based on numerical simulations of waves propagating upwards and downwards in coronal loops, we showed that the waves and their direction of propagation can be detected in the ratios of optically thin density sensitive lines.

Based on these results, we acquired high signal-to-noise profiles of the O IV density sensitive emission lines around 1400Å using the SUMER instrument on SoHO. Data for the quiet Sun obtained close to disk center and at the solar limb were acquired. After careful data processing in which disk data were analyzed differentially against limb data, we find a systematic correlation between a density sensitive emission line ratio and Doppler shift across the same emission line profiles. The correlation is such that the density is higher in the downflowing than in the upflowing plasma.

This agrees qualitatively with the results from the simulations of downward propagating waves in Wikstøl et al. (1997). Thus, if wave motions are responsible for the observed behavior, it naturally lends support to the “nanoflare” (Parker 1988) picture of coronal heating, but other mechanisms cannot be discounted.

A manuscript has been submitted to ApJ (Judge et al. 1997), where the observations, data analysis, results and implications are discussed in detail.

REFERENCES


(ESA SP-404, September 1997)

© European Space Agency • Provided by the NASA Astrophysics Data System