

Simultaneous observation of a Moreton wave on Nov 3, 1997 in H-alpha and Soft X-rays

Noriyuki Narukage[1], Tarou Morimoto[2], Reizaburo Kitai[3], Hiroki Kurokawa[4], Kazunari Shibata[5]

[1] Dep. of Astronomy, Kyoto Univ, [2] Kwasan Observatory, Kyoto Univ, [3] Hida Obs., Kyoto Univ, [4] Kwasan Obs., Kyoto Univ, [5] Kazan Astron. Obs., Kyoto Univ.

Moreton waves are flare-associated waves observed to propagate across the solar disk in H-alpha (Moreton, 1960). Such waves have been identified as the intersections of a coronal fast-mode shock fronts and the chromosphere (Uchida, 1967). We report the observation of a Moreton wave in H-alpha (line center and $\pm 0.8 \text{ \AA}$) with the Flare Monitoring Telescope (FMT) at the Hida Observatory of Kyoto University at 4:37-4:41 UT on November 3, 1997. The same region (NOAA 8100) was simultaneously observed in soft X-rays with the Soft X-ray Telescope (SXT) on board Yohkoh, and a wave-like disturbance ('X-ray wave') was also found. The position of the wave front as well as the direction of propagation of the X-ray wave roughly agree with those of the Moreton wave. The propagation speeds of the Moreton wave and the X-ray wave are about 490 km/s and 630 km/s, respectively.

Assuming that the X-ray wave is the MHD fast shock, we can estimate the propagation speed of the shock, based on the MHD shock theory and the observed soft X-ray intensities ahead and behind the X-ray wave front. It is found that the estimated fast shock speed is 430-810 km/s, in rough agreement with the observed propagation speed of the X-ray wave. The fast-mode Mach number of the X-ray wave is also estimated to be about 1.15-1.25. These results suggest that the X-ray wave is a MHD fast-mode shock propagating through the corona and hence is the coronal counterpart of the Moreton wave.