Quasi-Separatrix Layers and Coronal Loop Heating in an Active Region

T. Sakurai[1] and H.N. Wang[1,2]

[1] National Astronomical Observatory, Mitaka, Tokyo, Japan
[2] Beijing Astronomical Observatory, Beijing, China

Recently it has been discussed by DeMoulin et al. (1997) that the locus of (nearly) discontinuous linkage of magnetic field lines, called 'quasi-separatrix layers (QSLs)', may be a probable site of flare energy release. In this paper we investigated QSLs in an active region NOAA 7321 in a quiet phase, on 1992 October 26. A series of vector magnetograms and Hα images were obtained with the Solar Flare Telescope of NAOJ at Mitaka. Coronal loop structures were observed with the soft X-ray telescope (SXT) on Yohkoh. Taking the observed photospheric vector magnetic fields as the boundary condition, 3D magnetic field lines above the photosphere were computed. Through a comparison among 3D magnetic fields, Hα features and soft X-ray features, we found that the coronal loops and H-alpha plage regions correspond to the field lines making up the QSLs. It has long been wondered that, although coronal heating is basically due to magnetic fields, why some field lines show up as coronal loops and the others do not. The coincidence of QLSs and coronal loops gives a natural explanation for the reason why only a subset of field lines are illuminated. However, some coronal loops are much brighter than the others, indicating that there is enhanced heating in a limited subset of coronal loops. Such enhanced heating may have to be ascribed to the magnetic shear at the loop footpoints (Falconer et al. 1997) or to the emerging magnetic flux.