RELATIONSHIP BETWEEN HARD AND SOFT SOLAR X-RAY SOURCES OBSERVED BY OSO-7

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Summary. The UCSD experiment on the OSO-7 satellite has provided hard and soft X-ray observations of a large number of solar flares. Of these a sample of 123 had sufficiently large fluxes to permit analysis of their spectra (Datlowe *et al.*, 1974). The locations of these flares upon the solar disk have been obtained by comparison with Hα flare listings. We find that the soft (5.1–6.6 keV) X-ray bursts, above a threshold of 1000 photons (cm^2 s keV)$^{-1}$, have a relatively flat distribution from center to limb. The frequency of occurrence of hard (20–30 keV) X-ray bursts, as normalized to the longitude distribution of the soft X-ray bursts, shows a statistically insignificant excess of $19 \pm 34\%$ in the longitude range 80–90°. Furthermore, the limb flares exhibit a small but statistically significant spectral softening.

Brown (1972) and Petrosian (1973) have shown that a thick-target source model for the hard X-ray emission, under the assumption of a uniformly vertical magnetic field, should produce a strong limb-brightening pattern of hard X-ray burst occurrence. Such a model would explain the polarization observations of Tindo *et al.* (1972). The lack of limb brightening in the OSO-7 hard X-ray data suggests the incorrectness of this simple thick-target model with vertical streaming.

Further evidence against the simple thick-target model comes from the OSO-7 observations of hard X-ray bursts originating in solar flares which occurred beyond the limb, as identified by Roy and Datlowe (1974). The characteristics of these bursts were similar to those seen near the limb on the visible disk. For the 8 soft X-ray bursts which occurred at minimum visible heights greater than 10^4 km, 5 had detectable nonthermal components. Since this fraction is the same as that for bursts near the center of the disk, we conclude that significant hard X-ray fluxes originate high in the corona and that the soft and hard X-ray sources may have similar geometrical distributions.

References

Brown, J. C.: 1972, *Solar Phys.* **26**, 459.
Datlowe, D. W., Elcan, M., Hudson, H. S.: 1974, *Solar Phys.* **35**, 193.
Petrosian, V.: 1973, *Astrophys. J.* **186**, 291.
Roy, J. R. and Datlowe, D. W.: 1974, *Solar Phys.* **40**, 165.
Tindo, I. P., Ivanov, V. D., Mandelstam, S. L., and Shurygin, A. I.: 1972, *Solar Phys.* **24**, 429.

Sharad R. Kane (ed.), Solar Gamma-, X-, and EUV Radiation, 209.