

## I. PHYSICS

### Astrophysics (Solar Corona)

## HETEROGENEOUS STRUCTURES OF THE LOWER CORONA

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LITTLE is known about the structure of the lowest corona especially for  $h < 20000\text{km}$  which cannot be easily observed by the ground-based coronagraph outside the total eclipse. Kanno *et al.* (1971) found the marked intensification of  $6374\text{\AA}$  line below the height of  $3000\text{km}$  by using the same spectrograph as the one described above, and verified that coronal temperatures are actually present down to  $1000\text{ km}$  above the sun's limb. With NRL Skylab spectrograph Feldman *et al.* (1979) also found the maximum intensity of Si VIII ( $1445\text{\AA}$ ) and Fe XII ( $1242, 1349\text{\AA}$ ) coronal lines at 2 seconds of arc above the solar limb, and proposed a model of coronal plasma confined to the small structures. The first aim of the experiment was to examine the heterogeneous intensity distribution of the coronal emission lines along the quiet limb and check the applicability of the spherical symmetry approximation in the lower corona which was applied to the analysis of 1970 eclipse data (Kanno *et al.* 1971). Kurokawa (1975) found a cool and dense core ( $T = 10^6\text{ }^\circ\text{K}$ ,  $N_e = 6 \times 10^9\text{cm}^{-3}$  at  $17000\text{km}$ ) at the lower part of the coronal condensation by analysing the flash spectra of 1973 eclipse obtained with the same spectrograph as the one described above. At the same time, we arrived at the conclusion that monochromatic-image observations in various lines of different ionization potentials are most helpful for studying the coronal structures. The second aim of the experiment was to study the physical state of the coronal loops and arches over the active regions and prominences, and their interconnections with the chromosphere and prominence formation.

**Keywords :** Coronal Structure; Coronal Plasma; Coronal Emission Lines.

### EXPERIMENT

#### *Equipment*

(A) *Monochromatic Images Telescope* : Three 15cm and 10cm refractors equipped with monochromatic filters were installed on an equatorial mounting. Image sizes of the sun on the films were 30mm in diameter for  $5303\text{\AA}$ ,  $6374\text{\AA}$  emission line filters and 6100 continuum filter, and 80mm for  $H_\alpha$ . Bandwidths of the interference filters are  $3.5\text{\AA}$  for 5303 and 6374 filters,  $90\text{\AA}$  for 6100, and  $07.\text{\AA}$  for  $H_\alpha$ . Exposure times were changed successfully between 1 second and 32 seconds for 5303 and 6374 images with Kodak Tri-X 35mm film, and between  $1/16$  second and 32 seconds for 6100 and  $H_\alpha$  with Kodak SO 115 film.

(B) *Slot Spectrograph* : A 30cm coelostat was used to feed a  $f/15$  achromatic lens with a 30 cm aperture which focussed the radiation on to the wide entrance slot of the spectrograph. The primary aim of the spectrograph was to study the intensity distribution of 5303, 6374 and 7892 coronal lines in the chromosphere and

lowest corona, and two spectral ranges were photographed with the average dispersion of  $19\text{\AA}/\text{mm}$ ;  $4600\text{--}6900\text{\AA}$  with an aerial-survey camera and Kodak Tri-X aerographic 5 and 1/2 inches film,  $7600\text{--}8100$  with Nikon motor drive camera and Kodak high speed infrared 35 mm film. 1/4 second exposures were given before 2nd contact and after 3rd contact, and 2 seconds between 2 and 3rd contacts for the visible spectral ranges, while 1 second and 4 seconds for infrared region.

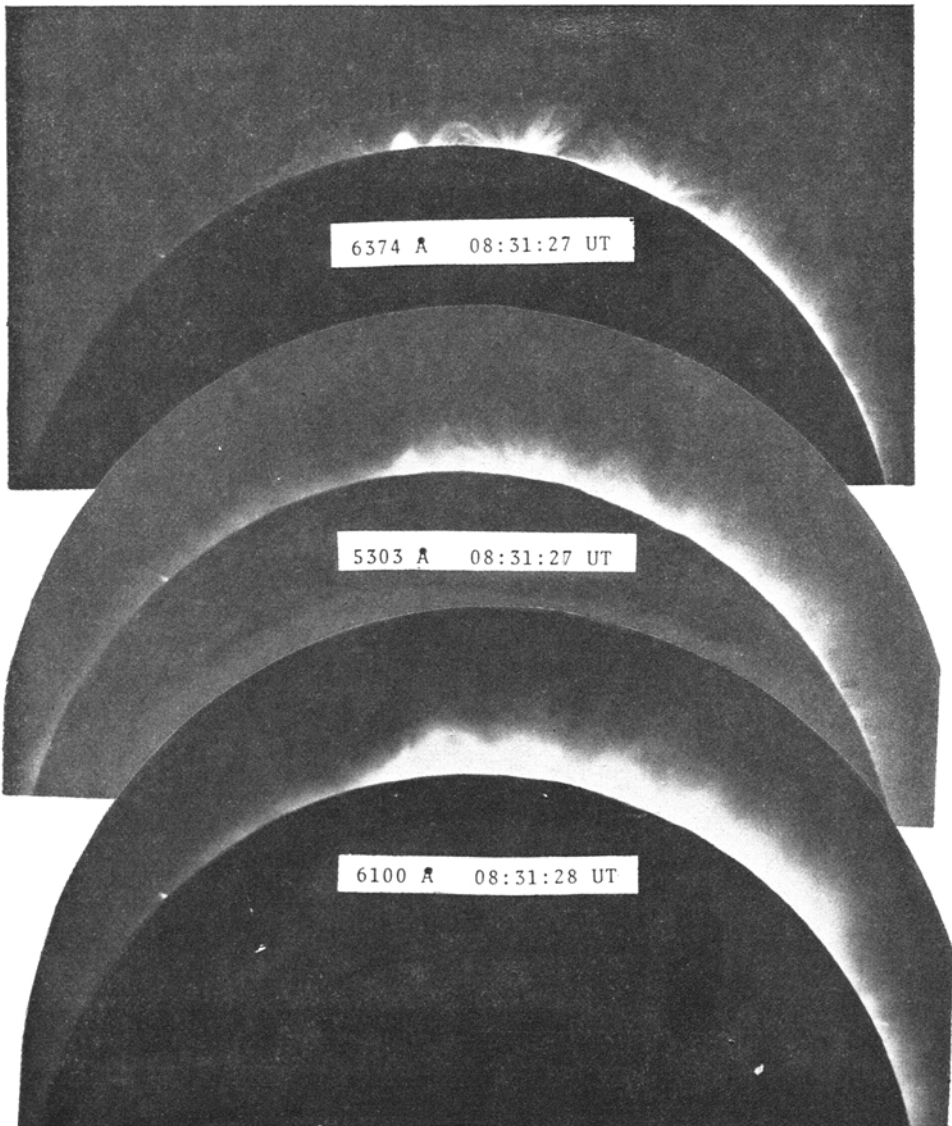


FIG. 1. Monochromatic images of the west limb.

## RESULTS

At the time of the total eclipse there existed thin clouds around the sun especially just after 2nd contact and near the mid-totality. But observation programmes were completely performed, and 230 frames of flash spectra for the visible spectral region, 120 frames for infrared region and 120 frames of monochromatic images were obtained successfully. Most of the frames were of fine quality to allow us to study the heterogeneous structures of the lowest corona. On the eclipse day three active regions came near the west limb and one near the east limb, and many conspicuous coronal loops could be seen over these active regions; 6374 fine loops are especially remarkable (Fig. 1). Preliminary examination of these loops shows some clear differences of appearance between 5303 and 6374 loops, while there seems to be a fairly good coincidence between 5303 and continuum loops. Detailed photometries of these structures are in progress.

## LOCATION

Italian Rocket Range, Ngomeni (North of Malindi).

## REFERENCES

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