of sudden enhancements of atmospherics with surge appearances³. Projected on the disk the surges are, as a rule, connected with some bright H α event in the underlying chromosphere (flare, plage brightening). We selected from our observations only those limb surges the disturbed underlying chromospheric region of which was behind the limb on the back side of the Sun. From these limb surges we excluded those coinciding in time with some other H α event on the Sun, in order to eliminate ambiguity. The list of the remaining limb surges accompanied by sudden enhancements of atmospherics and eventually by radio radiation is given in Table 1.

We conclude that the sudden enhancements of atmospherics accompanying the limb surges could be interpreted as X-ray radiation emitted by the adjacent region of the solar corona.

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Rocket and Satellite Observations of the Solar Ultra-violet Spectrum

THE Lyman lines of hydrogen, as well as the corresponding lines of He I and He II, are of interest both as tools for analysing the solar atmosphere and as energy sources for the terrestrial ionosphere. So far, interest in these lines has centred mainly around the Lyman- α lines because of their greater strength.

Rocket and satellite programmes are under way for the continuous monitoring of the energy-flux and the accurate determination of the profiles of the Lyman- α lines. It is the purpose of this communication to direct attention to the unusual importance of parallel observations of the Lyman- β lines.

In the Doppler core of a line, the source-function, S , may be written in the form:

$$S = \frac{\gamma B}{\rho + \beta}$$

where B is the Planck-function, γ is slowly dependent upon electron density and kinetic temperature, and β and ρ are dependent upon the opacity as well as electron density and temperature. Our interest here lies in the evaluation of ρ , which represents the net rate of radiative transitions in the line normalized to unity in the case of no absorptions.

The evaluation of ρ requires integration of the equation of radiative transfer¹. At $\tau \approx 1$, $\rho \gg \beta$. However, the explicit value of ρ depends markedly on the temperature gradient in the regions of the atmosphere for which $1 \lesssim \tau \lesssim (3\beta)^{-1/2}$. In the case of the Lyman- α lines, $(3\beta)^{-1/2} \gtrsim 10^3$ for H and He I and $\gtrsim 10^4$ for He II. On the other hand, for the Lyman- β lines $(3\beta)^{-1/2} \approx 2$. Thus, the intensities near the centres of the Lyman- α lines are influenced by the temperature structure throughout a large range in τ , whereas the intensities near the centres of the Lyman- β lines are determined primarily by

the 'local' conditions at $\tau = 1$ in the solar atmosphere. For this reason, data for the Lyman- β lines present a much stronger supplement to Lyman- α data than if the two lines behaved in the same way, and the analysis of one line will be greatly facilitated if data for the other line are available.

A more detailed report of this work will appear elsewhere.

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PHYSICS

Silver-activated Nitrocellulose as Recording Material for X-Ray Microscopy

ELECTRON optical enlargement of X-ray absorption micrographs has been discussed by Pattee¹ and Asunmaa². A contact micrograph is recorded on a thin layer of material sensitive to X-rays in which the absorbed radiation promotes physical or chemical changes that modify the areal electron density. For example, there may be a decomposition resulting in soluble products which are afterwards removed³. A relief image with details of submicroscopic scale then shows an electron optical contrast. For electron optical enlargement of an X-ray absorption micrograph (instead of a replica of it) certain conditions are necessary, particularly if the electron micrograph is to reproduce the quantitative properties of the X-ray absorption images².

Most film materials thin enough for recording X-ray images with good resolution and suitable for use in transmission electron microscopy as specimens with so-called characteristic thickness are radiographically slow. Recording speed can be increased by additional absorbers and by selection of radiation-induced reactions with considerable quantum yield.

Nitrocellulose activated by a radiation trap (inorganic crystals or organic degradative dyes in alkaline or acidic media) meets the requirements for recording speed and has been found to possess other suitable properties such as reduced sensitivity after development of the X-ray record. The irradiated areas of the film are efficiently destroyed, because of the sensitivity of the β -glucosidic bond of cellulose to ultra-violet and X-ray energy, and because of the autocatalytic degradation of the cellulose nitrate, which is accelerated by radiation, to form products of low molecular weight through depolymerization, denitration and hydrolytic degradation. A subsequent fractionated extraction removes the main part of the degradation products from the polymer matrix and the small molecules diffuse readily in the solvated solid. X-ray absorption by the polymer is favoured by the uniform distribution of compounds sensitive to radiation, namely, tetrazolium chloride in previous experiments², or submicroscopic silver halide crystals in a so-called Goldberg emulsion, known for its fine grain in photographic processes⁴ and now utilized for its nitrocellulose component.

Goldberg emulsion was produced by mixing lithium chloride and silver nitrate solutions to form silver chloride dispersed in an acidic medium of 2 per cent