gion. Apart from the implications of ERTOR with regard to physical meteorology, variations in this parameter appear to be related to solar activity. ERTOR is determined from daily measurements of atmospheric flux and emissivity at 9.6 microns.

A plot of weekly mean values of observations for July 1953 to July 1954 shows an unmistakable periodicity of about ten weeks.

The annual trend of ERTOR is accurately fitted by the least-squares sine curve

$$T = \left\{ -41.3 + 2.439 \cos \left[\frac{\pi}{26} (t + 0.264) \right] \right\} ^\circ\text{C},$$

where T is ERTOR, and t is the time in weeks measured from the summer solstice. The maximum and minimum values occur at the solstices.

A harmonic analysis of the lag correlation coefficients of weekly mean ERTOR emphasizes the ten-week periodicity and reveals weaker ones of six and two and one-half weeks, respectively. Together with the least-squares annual trend they account for more than 80 per cent of the variance of the data.

The origin of these periodicities is unknown. The following discussion suggests that the sun may be involved.

The planetary magnetic activity index compares interestingly with short-term variations in ERTOR. Two examples will be given.

The abrupt rise in geomagnetic activity, K_p , from 19–22 August to 23–27 August 1953 is remarkable for its range. A strikingly similar pattern of variation is evident in daily mean ERTOR during the same period.

The weekly mean values of K_p , July 1953–July 1954, are compared with weekly mean ERTOR residuals from the annual trend. Sixty-five per cent of the time the ERTOR residuals and K_p rose and fell together. It may be significant that the major violations of this rule coincided with the presentation to the earth of the uniquely intense solar regions 53-Rp and 54-Gp (CRPL F-series).

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Athay, R. G. The helium chromosphere.

The flash-spectrograms obtained by the High Altitude Observatory expedition to the 1952 eclipse in Khartoum contain several helium lines that are suitable for photometric reduction.

Some of these lines have not been studied quantitatively at previous eclipses, and our spectrograms were taken with much greater height resolution than had been previously attempted. These features make a study of the helium data from the 1952 eclipse of special interest. The HeI data include the first four lines of the $2^3P - n^3D$ series, the first three lines of the $2^3P - n^3S$ series, the first line of the $2^1P - n^1D$ series and the first three and fifth lines of the $2^1P - n^1S$ series. The $HeII$ data are for $\lambda 4686$, $3^2D - 4^2F^0$.

The data show maxima in the surface brightness of the chromosphere at the limb at heights of ~ 1100 km for HeI emission and ~ 1500 km for $HeII$ emission. Both the hydrogen and helium data show that if the chromosphere is assumed to be uniform the radial optical depth at $\lambda 500$ is ~ 200 at the height where the maximum HeI emission occurs. These large optical depths exclude the possibility of excitation of chromospheric helium by ultraviolet coronal radiation if the chromosphere is uniform. Kinetic temperatures obtained from an analysis of the continuum data under the assumption of a uniform chromosphere are too low to produce the observed excitation of helium. Thus the assumption of a uniform chromosphere appears to be invalid for the helium data, and we assume a two-region model with all of the helium emission coming from one region.

The triplet series of HeI have excitation temperatures of $\sim 5000^\circ$, and the singlet series have excitation temperatures of $\sim 15,000^\circ$. If we assume approximate thermodynamic equilibrium for $HeII$ and the singlet series of HeI and use a relative abundance of hydrogen to helium of 7:1, the observed line intensities for both HeI and $HeII$ require kinetic temperatures of $\sim 19,000^\circ$ in the regions above 1500 km that emit the helium radiation. If we vary b_1 within the limits $10^{-4} \leq b_1 \leq 10^4$, the kinetic temperature in the helium region varies between $14,500^\circ \leq T_e \leq 26,000^\circ$. The maximum in the $HeII$ emission at 1500 km leads to $T_e \sim 20,000^\circ$, in agreement with the values obtained by other methods.

Continuum data show that the electron temperatures and densities below 4000 km in the regions that do not emit helium radiation are essentially unchanged from the results obtained on the assumption of a uniform chromosphere (Athay *et al.* 1955). Above 4000 km the non-uniform model leads to higher temperatures in these regions. The eclipse spectrograms show conclusively that above 5000 km the helium radiation is in the spicules.