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Regular variations of characteristics of the molecular oxygen airglow Atmospheric system

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The Atmospheric system of the molecular oxygen emission, which consists of the bands (0-0) at 762 nm and (0-1) at 865 nm, arises in the result of atomic oxygen recombination in the lower thermosphere. Importance of its investigation is that variations of its characteristics reflect many dynamical and photochemical processes in this atmospheric region. In the given work, on the base of material of the published researches and observations carried out in Zvenigorod Observatory (56N, 37E) near Moscow, Russia, the systematization of data on regular variations of the intensity, rotational temperature and height of the molecular oxygen emission layer has been made. The following variations were paid attention: (1) diurnal, (2) lunar, (3) seasonal and (4) latitudinal. Each of these variations was approximated by three sinusoids. The zenith angle of the Sun as the argument of the diurnal function was taken instead of local time. The argument of the function, approximating the lunar variations, was the phase of the Moon. The dependence of the characteristics on the index of solar activity (F10.7) and their long-term trend are presented in the linear form, from which it is seen that the changes of the intensity and rotational temperature are 5% and 1.3 K per 100 sfu in the first case and 1.5% and 0.5 K per year in the second case. Also the correlations between the different characteristics of the emission were obtained. Thus, the empirical model of the variations of the intensity, rotational temperature and height of the molecular oxygen airglow layer was created. It allows us to estimate these characteristics for different helio/geophysical conditions. This work was carried out at the financial support by the Russian Foundation for Basic Research grant 05-05-65275.