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Brightness variations of the 630.0 nm nightglow in the Asia region

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From the observations by the ISUAL (Imager of Sprites and Upper Atmospheric Lightning) payload onboard the FORMOSAT-2 satellite, the bright airglow emissions are often observed around midnight at equatorial latitudes and show their tendencies of seasonal variations. It is suggested that these emissions are the signature of thermospheric midnight temperature maximum (MTM) effect. In order to understand the consequence of MTM effect, we focus on the Asia region and calculate the volume emission rates of the 630.0 nm nightglow to investigate the influence of neutral temperature and meridional neutral wind. We utilize the SAMI2 model to simulate the charged and neutral species under different temperatures at the 630.0 nm nightglow emission layer. It is found that a turning point shows up as the temperature changes, named turning temperature (Tt). Two kinds of tendencies can be seen: firstly, Tt decreases with the emission rate for the same altitude; secondly, for approximately the same emission rate, Tt increases with the altitudes. From the ISUAL observations, we frequently find patterns similar to our simulation results during the selected seasons. The results of observation and simulation all show that the neutral wind is more efficient to affect the emission rates of the nightglow than temperature variation.