Effects of the planetary waves in the MLT airglow simulated by the Kyushu GCM

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Temporal variations of the order of days in the airglow emissions originating from MLT region have been observed and reported in the last two decades. These variations are usually attributed to planetary waves that pass through airglow emitting layers. In spite of this, the effect these waves in the airglow emissions and their influence in the compositions, such as in the atomic oxygen mixing ratio, are not fully understood. In order to investigate these issues we have used simulations performed by the General Circulation Model (GCM) of the Kyushu University. The model incorporates processes for atomic oxygen production, loss and transport, what enables to simulate some airglow emissions in the MLT region. The GCM was used to simulate OH Meinel and atmospheric molecular oxygen bands and atomic oxygen green line emission rates. In middle latitudes, the results show that variations ranging from 2 to 20 days in the emission rates are common. While variations in the emission rates around 2 days are prominent in the summer, longer period variations, from 5 to 20 days, are recurrent between autumn and spring equinoxes. This agrees quite well with what has been reported in the measurements. The GCM simulations also enable to investigate vertical transport processes and their effect in the emissions. The results show that vertical transport of atomic oxygen by vertical advection due to the wave field motion is the main responsible for the signatures of the planetary waves in the emission rates.